TEXTILES PAPER LEATHER

# AMERICAN DYESTUFF REPORTER

Including the Proceedings of the
AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

VOLUME XII APRIL 23, 1923 NUMBER 9

PAINTS INKS RUBBER

THE NEWPORT COLORS

*The Highest Quality*

Newport Primuline Extra Conc.

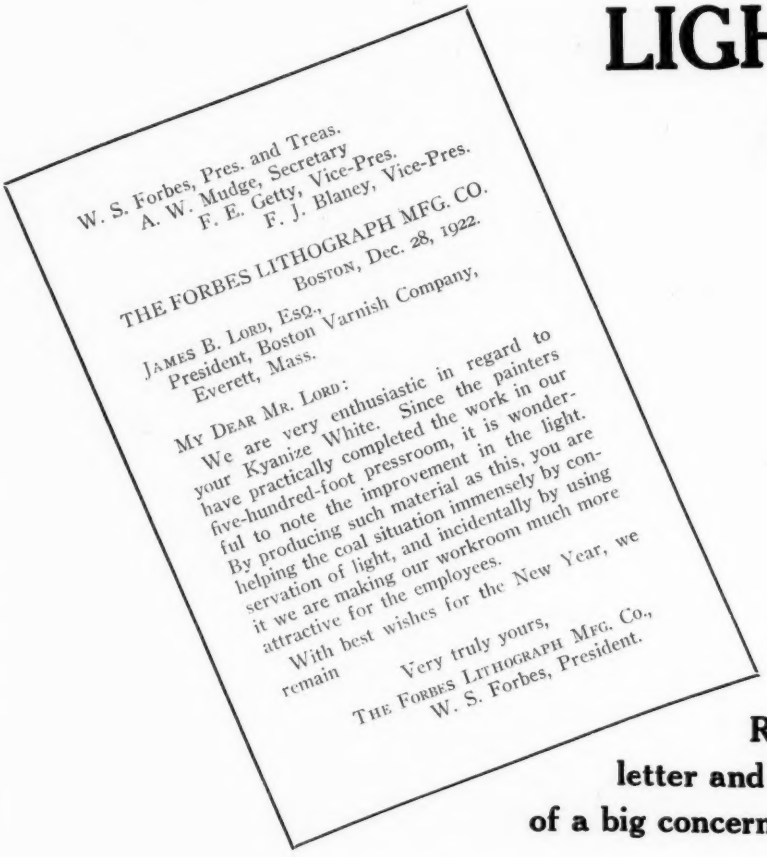
Superior in every respect

NEWPORT
REG U.S. PAT OFF
"COAL TO DYESTUFF"

Newport Chemical Works, Inc.

Passaic, New Jersey

BOSTON, MASS. PROVIDENCE, R. I. PHILADELPHIA, PA. GREENSBORO, N. C. CHICAGO, ILL.



W. S. Forbes, Pres. and Treas.
A. W. Mudge, Secretary
F. E. Getty, Vice-Pres.
F. J. Blaney, Vice-Pres.

THE FORBES LITHOGRAPH MFG. CO.

Boston, Dec. 28, 1922.

James B. Lord, Esq.,
President, Boston Varnish Company,
Everett, Mass.

My Dear Mr. Lord:

We are very enthusiastic in regard to your Kyanize White. Since the painters have practically completed the work in our five-hundred-foot pressroom, it is wonderful to note the improvement in the light. By producing such material as this, you are helping the coal situation immensely by conservation of light, and incidentally by using it we are making our workroom much more attractive for the employees.

With best wishes for the New Year, we remain

Very truly yours,
The Forbes Lithograph Mfg. Co.,
W. S. Forbes, President.

# LIGHT—

## Next to labor the most important factor in your production

**Read the accompanying letter and see what the president of a big concern says about**

# BOSTON MILL WHITE

The ideal white for interiors of factories, Mills, and all such buildings, equally as good over wood or brick. Sample panel and material gladly sent either factory or mill executives.

***Send Coupon***

## BOSTON VARNISH COMPANY

**Everett Station**

**Boston 49** **MASS.**

COUPON

BOSTON VARNISH COMPANY,
Everett Station 49, Boston, Massachusetts.
Gentlemen:
Kindly send us panel showing your BOSTON MILL WHITE.
Also let us have your prices.


American Dyestuff Reporter, Vol. XII, No. 9. April 23, 1923. Published biweekly by Howes Publishing Co., Woolworth Building, New York, N. Y. Domestic subscription, $5.00; Canadian, $5.50; foreign, $6.00. Entered as second-class matter Nov. 6, 1919, at the New York, N. Y., Post-office, under the Act of March 3, 1879. Copyrighted, 1922, by Howes Publishing Co

# *Technical Service to Dyestuffs Users*

STANDARD DU PONT DYESTUFFS UNIFORM

Dyestuffs Bulletins similar to the above are available for every du Pont dyestuff. They cover thoroughly the properties of the dye and instructions for its use. Write us for those covering colors in which you are interested.

**E. I. DU PONT DE NEMOURS & CO., Inc.**

**WILMINGTON, DELAWARE**

# Refinements in Mechanical Construction

Motor Drives, with silent chain running in oil.

All gears cut and totally enclosed.

Push Button Panel for control and operation of machine.

No slipping of clutches. Speed constant. Cost of installation no more than clutch driven machines.

PATENTEES AND MANUFACTURERS

**Hussong Dyeing Machine Company - - Groveville, N. J.**

# OUR ACID COLORS

Meet most exacting requirements for colors of this nature to be

## FAST TO LIGHT

## JENNINGS & COMPANY

INCORPORATED

**93 Broad Street** **Boston, Mass.**

## UNITED CHEMICAL PRODUCTS CORPORATION

IMPORTERS, EXPORTERS AND MANUFACTURERS

YORK AND COLGATE STS., JERSEY CITY, N. J.

**ANILINE COLORS**

ACID DIRECT BASIC

CHROME AND SULPHUR

UCPC

**SUMAC EXTRACT**

LOGWOOD, HEMATINE,

GAMBIER, FUSTIC, ETC.

**CHEMICALS**

SOLUBLE OILS, SOAPS, SOFTENERS, SIZES, GUMS AND FINISHES

CHARLOTTE, N. C. ———BRANCHES——— PAWTUCKET, R. I.

# It Starts in Many a Laundry Basket

SHE bought the garment originally because of the unusual solidity, brilliancy and beauty of its fashionable colors. Now, as it comes from the Laundry with those colors undimmed, proving its remarkable fastness, she remembers that the saleswoman in the store said something at the time about a patented process of dyeing.

Perhaps she remembers that the name "Franklin" was used, perhaps not. But the maker's name is on the garment, and that's the brand she will buy next time, the brand she will go so far as to DEMAND.

Her demand works back through the store to the maker, from the maker to the house that sold the cloth, and from that wholesale house right into your mill. And you find that you have a new asset, a new sales feature in your goods.

## *FRANKLIN PROCESS DYEING*

Is known to hundreds of thousands of women today. Some actually know the name of the process. Others know merely its RESULTS in Solidity, Brilliancy, and Fastness of color. They know that something has happened to the Dyeing Industry that pleases them and their pocket books.

Go out and meet this demand by investigating and using our dyeing service now in connection with your colored goods. Tell the nearest of our three big dye houses to send a man to tell you all about Franklin Dyeing.

## FRANKLIN PROCESS CO.

Philadelphia PROVIDENCE Manchester, Eng.

New York Office, 72 Leonard Street

SOUTHERN FRANKLIN PROCESS CO.

Greenville, S. C.

# AMERICA'S LEADING BLACKS

**AMIDINE FAST BLACK FF EXTRA**
(Pre-war prototype: Columbia Black FF Extra)
A green shade of Black, FAST TO ACID, MILLING, also adopted for dyeing of delicate shades of Gray, and for the dyeing of Unions.

**KROMEKO FAST BLACK F EXTRA CONC.**
(Pre-war prototype: Diamond Black F)
A Chrome Black suitable for METAL MACHINE DYEING, fast to light, fulling, and recommended for raw stock, slubbing and piece dyeing.

**AMIDINE DEVELOPED BLACK B H S W**
(Pre-war prototype: Diamine Black BH)
Produces a deep bloomy shade of Jet Black when diazotized and developed; suitable for hosiery work and piece dyeing, and having the property of leaving silk white. It is also recommended for Speck Dyeing.

**ACEKO BLACK 10B HIGH CONC.**
(Pre-war prototype: Napthylamine Black 10B Conc.)
An Acid Black of the highest purity and concentration, suitable for dyeing of worsted material and woolens, giving deep shades of Black with a greenish tone.

***Send for Samples and Prices***

ESTABLISHED 1876

JOHN CAMPBELL & COMPANY, 75 HUDSON STREET, NEW YORK, N.Y.

*American Dyestuff Manufacturers*

BRANCHES

BOSTON CHICAGO PROVIDENCE SAN FRANCISCO PHILADELPHIA TORONTO

"STANDARDS EVERYWHERE"

Established 1895

# BOSSON & LANE

*Manufacturers of*

The Original

## BLEACHING OIL

for boiling out Cotton, to produce a foundation for a Pure White

High Grade Sulphonated and Saponified

## CASTOR OIL PRODUCTS

## Para Soap Oil

Solvents and Assistants for cleaning all Textiles

B & L Bleachers' Bluings and Tints

***Works and Office, ATLANTIC, MASS.***

In the dyeing of Wool Felts there are two essentials, one is thorough Penetration and the other is Levelness of Dyeing.

## Silk Brown G

answers both of these requirements. Every dyer of Wool Felts should be familiar with this color.

# ALTHOUSE CHEMICAL CO.

**READING, PA.**

**The L. B. Fortner Co.**
102 Pearl St., Boston, Mass.
Sole Selling Agents for New England.

Reg. U. S. Pat. Off.

Also a complete line of Acid, Basic, Chrome, Sulphur and Direct Colors, Intermediates, Cotton Finishes, Turkey Red Oils, Soluble Oils and Leather Oils

Manufactured by the following and other American Manufacturers—

Consolidated Color & Chemical Co.
Central Dyestuff & Chemical Co.
Williamsburg Chemical Co.

**INDANTHRENE**
**HELINDON**
**THIO-INDIGO**
**HYDRON**
**ALGOL.**

and other vat dyes will be imported by us direct from the manufacturers.

H. A. METZ & CO. Inc.
One-Twenty-Two Hudson Street New York City.
Boston Philadelphia Providence
Chicago Charlotte San Francisco

FARBWERKE VORM. MEISTER, LUCIUS & BRÜNING
FARBENFABRIKEN VORM. FRIED. BAYER & CO.
CHEMISCHE FABRIK GRIESHEIM-ELECTRON
LEOPOLD CASSELLA & CO.
FARBWERKE-MÜHLHEIM
KALLE & CO.

# F. E. ATTEAUX & COMPANY, Inc.

**172-178 Purchase Street, Boston**

Sole Selling Agents for

**Palatine Aniline & Chemical Corp.**
Poughkeepsie, New York

***New Product***

**Empire Coralline—for Wool and Silk**

Brilliant color of exceptional fastness to light and milling.

**F. E. ATTEAUX & COMPANY, Inc.**

BOSTON NEW YORK PHILADELPHIA CHICAGO

# Chemical Specialists
to the
# Textile Industries

AMONG THE SPECIALTIES WHICH WE MANUFACTURE ARE:

**MONOPOLE OIL**
Reg. Trade Mark No. 70991

A double Sulphonated Castor Oil of superior merit for all purposes for which Turkey Red and Soluble Oils are ordinarily used. Ask for booklet.

**TEXTILE GUM**
For fabric printing.

**BOIL-OFF OIL**
Replacing soap in degumming silk.

**BLEACHING OIL**

**BENSAPOL**
For scouring wool.

**ALIZARINE YELLOWS**

**MORDANTS and CHROME COLORS**
For fabric printing.

**GUMS**
Arabic, Tragacanth, Karaya.

**HYDROSULPHITE**
For stripping and discharge printing.

**INDIGOLITE**
For indigo discharge only.

## JACQUES WOLF & CO.
MANUFACTURING CHEMISTS AND IMPORTERS
PASSAIC, N. J.

## ZINSSER & CO.
Hastings-on-Hudson :: N. Y.

## Alizarine
Black, Blue, Browns, Violet and Green

## in Paste
for Calico Printers

## in Powder
for Wool and Silk Dyers

Write for samples and information

# Anthrole Oil
Used in the Dye Bath!

To eliminate harshness in the stock.

Assists in reducing waste on the cards.

Productive of brighter and faster shades in dyeing.

## ARKANSAS CO., Inc.
253 Broadway
New York City

# MATHIESON Chemicals

## *Service That Protects You*

**WHEN you specify Mathieson Chemicals you take advantage of a service that eliminates delivery uncertainties.**

**Our own stocks of "Eagle Thistle" products are carried on consignment with our carefully selected distributors, whose warehouses are in principal cities throughout the country.**

**These stocks are for the service of less-than-carload users and for the emergency supplies of carload consumers. You deal with us, just as though shipment were made direct from our works.**

**Can you afford not to avail yourself of Mathieson Service?**

*The* MATHIESON ALKALI WORKS *Inc.*
25 WEST 43rd STREET NEW YORK CITY

PHILADELPHIA CHICAGO
PROVIDENCE CHARLOTTE

**Deal Direct with the Manufacturer**

# KLAUDER-WELDON

## Dyeing-Bleaching-Scouring Machinery

There are K-W machines in use which were built nearly half a century ago and which are still doing their work efficiently and economically under severe service. This is sufficient evidence of the durability and capability of K-W Machines after long years of subjection to the ravages of live steam, heat and alkalis.

K-W Machinery by its accomplishments has steadily and irresistibly built up a reputation that has made the name "Klauder-Weldon" synonymous with the **"world's best dyeing, bleaching and finishing machinery."**

Our interest in upholding the K-W reputation means that you MUST be satisfied, and our suggestions to prospective purchasers are made with the view toward solving any dyeing, bleaching or scouring problem for all time. We will be glad to answer any and all questions without obligation on your part whatsoever.

**Write today for K-W Literature**

## The Klauder-Weldon Dyeing Machine Co.

**Bethayres, Pa., U. S. A.**

H. G. Mayer, Southern Agent.
Realty Bldg., Charlotte, N. C.

# RÖHM & HAAS CO.

**Manufacturers of**

## CHEMICALS

**40 North Front St., Philadelphia, Pa.**

### SPECIALTIES

LYKOPON—Concentrated Hydrosulphite for reducing Indigo and vat dyes.

FORMOPON—For discharge work.

FORMOPON EXTRA—For Stripping.

INDOPON W—Indigo Discharge Assistant.

TARTAR EMETIC—Technical.

### CHEMICALS

Sodium Sulphide, Sodium Bisulphite, Sulphate of Alumina, Acids, &c.

*For* ***TEXTILE MILLS***

## The Tide Water POWER GROUP

Straight mineral and compounded oils of viscosities best suited to meet the exacting requirements of textile mill lubrication.

**Blanquol Loom Oils** **Dynol Engine Oils**
**Suprol Cylinder Oils** **Turbol Turbine Oils**
**Tycol Bearing Greases**

### Tide Water Lubricating Staff

We have put on a scientific basis the selection of the proper lubricants for particular purposes by the creation of the Tide Water Lubrication Staff.

A Staff Engineer will be glad to visit your plant and supply you with a Lubrication Report on the more economical lubrication of *your machinery.*

*A word from you will bring*
*him to your door.*

## TIDE WATER OIL SALES CORPORATION

**11 Broadway, New York**

# Consult Us About Your Dyeing Problems

The services and advice of an expert chemist and a well equipped laboratory are at your disposal without cost, except when special research or experimentation is necessary, when the charges will be of a minimum nature.

## American Dyestuff Reporter

**Woolworth Bldg.** **New York City**

# Contents of This Issue

April 23, 1923

The Analysis of Tannins and Tannin Mordants ..... 307
Ismar Ginsberg, B.Sc., Chem.

Foreign Dyes Imported Through the Port of New York During March..... 312

Proceedings of the American Association of Textile Chemists and Colorists:
March Meeting, New York Section..... 313
Use of Titanous Chloride in Quantitative Dye Testing. *A Paper* by Oscar R. Flynn ..... 313
Discussion ..... 316
February Meeting, Rhode Island Section.. 320
Use of Fats and Oils in the Cotton Finishing Industry. *Abstract* of a paper by Richard B. Earle..... 320
March Meeting, Rhode Island Section.... 322
The Systematic Handling of Dyestuffs in Practice and the Practical Application of the Metric System. *A Paper* by William F. Deady..... 322
Organization of Lowell Textile School Junior Branch ..... 325
First Meeting, Lowell Textile School Junior Branch ..... 325
Fulling Oils vs. Soap. *A Paper* by A. Seymour Mann ..... 325
Method of Analysis of Hydrosulphites and Sulphoxylates. *Abstract* of a paper by Edward L. Helwig, read before Philadelphia Section ..... 327
Changes in Address..... 328
Notice of May Meeting, New York Section ..... 328

Editorial:
Stop Peddling Excuses..... 329

The Bleaching of Yarn Made from Bast Fibers ..... 335
E. Clayton, F.I.C.

Beam Dyeing (concluded)..... 341
H. Jala

QVALITY COLORS
UNITED STATES COLOR AND CHEMICAL CO. INC.

**Anthranol Chrome Blue Black AR**

**Dyes chrome mordant or top chromed. Recommended for fast shades of navy blue or all classes of stock. On account of its shade, level dyeing properties and solubility it is especially suitable for piece dyeing**

**Anthranol Chrome Brown W**

**Dyes chrome mordant or top chromed. Is fast to light and fulling. The most level dyeing brown on the market.**

**Acid Chrome Blue F 4 B**

**Similar to the pre-war Chromotrope F4B. Of special interest for dyeing piece goods to leave silk white.**

**United States Color & Chemical Company, Inc.**

**93 Broad St. Boston, Mass.**

**New York Office: 25 Howard St.**

**FACTORIES:**
**NEW ENGLAND ANILINE WORKS, Inc.**
**Ashland, Mass.**

**GARFIELD ANILINE WORKS, Inc.**
**Garfield, N. J.**

## WHAT WILL THE DYE DO?

THE right dye—a "National" dye—will do what its specifications say it will do. If at any time the results are not perfect, tell the "National" salesman—he will place the "National" Practical Dye Specialists at your service.

Recently, a dyer reported that a "National" indigo shade had developed cloudiness. Investigation proved that he was using too small a volume of dye-bath for the quantity of cotton being dyed. Specify "National" dyes—and use the "National" Technical Service.

**National Aniline & Chemical Co., Inc.**

40 Rector Street, New York, N.Y.

| | | |
|---|---|---|
| *Boston* | *Philadelphia* | *San Francisco* |
| *Providence* | *Charlotte* | *Toronto* |
| *Hartford* | *Chicago* | *Montreal* |

# "NATIONAL" DYES

NATIONAL U.S.A. DYES

# AMERICAN DYESTUFF REPORTER

*"Circulated Everywhere Dyestuffs Are Used"*

**Devoted to the practical application of dyestuffs in all industries; especially to textile chemistry—the science and practice of scouring, bleaching, dyeing and finishing.**

VOLUME XII NEW YORK, APRIL 23, 1923 NUMBER 9


# The Analysis of Tannins and Tannin Mordants

**The Different Tannins and Tannic Acids—Important Tannins Used in Dyeing Practice—The Oxidation Method of Tannin Determination—The Schroeder Variation of the Lowenthal Method—Testing the Indigo Solution—Details of the Titration Method—Preparation of the Tannin Extracts —Determination of Tannin in Gallnuts (Ground)—Standardization of the Permanent Solution Against Tannin—Calculation of the Standard—Qualitative Tests of Tannins by Dye Trials—Tests with Catechu Colors**

By ISMAR GINSBERG, B.Sc., Chem.

THE word "tannins" is a general name given to a certain class of vegetable substances, all of which contain a certain astringent principle, comprising an organic acid or derivative thereof. While both the nature and the proportion of this astringent principle may vary grealy in the various tannins, all tannins possess one property in common, and that is their ability to precipitate gelatine and convert hide into leather. The exact composition of the tannins, which are complicated organic substances, is not known, but it is well understood that their action on the substances with which they come in contact, be it the albumen in hides or a textile fabric, is quite different in intensity with each particular tannin. Practically all of them can be used as mordants in the dyeing and printing of textile fabrics.

The importance of these substances to the dyer lies in their ability to fix certain dyes on the fiber. Cotton will absorb tannins, which have to be fixed on the fiber by means of tartar emetic or iron salts to form insoluble tannates. This process is used in dyeing cotton with basic dyes and also in calico printing. Silk is weighted with tanning solutions in black dyeing. Wool can also be treated with tannins, which are fixed by means of tartar emetic or stannous chloride, and by this treatment it is made resistant to certain kinds of dyestuffs.

## The Different Tannins and Tannic Acids

In order to be able to carry out an analysis of a tannin or a tannin mordant or to determine the relative effects of the various vegetable tannins on the fibers, mordanted or weighted with them, it is first necessary to understand just what the tannins are, what their origin is and how they differ from one another. For it is their content of active astringent and the character of that astringent that determines just what results will be obtained with them in dyeing and printing processes. The importance of this subject to the dyer is due to the fact that these substances, while well known and well understood from the standpoint of the leather manufacturer, are not so familiar to the dyer, and furthermore that, while the leather man has a very simple, effective and accurate method for analyzing them and obtaining results which have a direct bearing on their value as tanning materials (this is done by the so-called gravimetric hide powder process), the dyer is not fortunate enough to possess such a method.

All tannins contain a certain kind of tannic acid. There are three such acids that are of importance. The first is known as gallo-tannic acid or tannic acid, for short. The formula for this acid may be written as follows, considered as a digallic acid: $C_6H_2(CH)_3.CO.O.C_6H_2(CH).COOH$. The solution of this acid has an acid reaction and gives a deep blue color with iron chloride. Another acid is ellagic-tannic acid $C_{14}H_{10}O_{10}$. This acid is immediately converted into ellagic acid by heating in heat to a temperature of 100 deg. Cent. The third acid is known as catechuic-tannic acid, whose formula is $C_{21}H_{18}O_9$.

## Important Tannins Used in Dyeing Practice

There are seven different tannins which are of importance to the dyer. The first of these is galls or gallnuts. These are ball-shaped incrustations which grow on various plants, such as oak trees, and which are due to the sting of insects. There are three varieties of gallnuts: the oak galls with 55 to 60 per cent gallo-tannic acid,

about 40 per cent gallic acid; the Chinese galls with 65 to 75 per cent gallo-tannic acid; drillets with 25 to 30 per cent of gallo-tannic acid. Another tannin is sumac, which comes in the form of crushed or cut leaves, containing 15 to 27 per cent gallo-tannic acid. Sumac extract contains as high as 27 per cent gallo-tannic acid. The sumac that comes from Sicily is the best in quality and the least colored. American or Vrginian sumac is also of high quality.

Then there is the tannin material called myrabolans, which contains 25 to 45 per cent tannin, consisting of ellagic-tannic acid. Myrabolans are the fruit of certain Chinese and Indian plants. The tannin contain a yellowish brown coloring matter and is used mostly for dyeing cotton black shades. The fourth important tannin is material divi-divi, which contains 19 to 35 per cent tannin. This is the fruit of certain Central and South American plants. Valonia contains 25 to 35 per cent tannin, while chestnut extract another tannin material contains up to 40 per cent tannin of unknown constitution. Finally there is catechu, $C_{21}H_{20}O_9$, catechu-tannic acid (catechu brown or red, 20 to 40 per cent, Bombay and Bengal, Catechu yellow-Gambier—20 to 35 per cent).

## The Oxidation Method of Tannin Determination

The standard method for determining the amount of tannin in the tannin mordants is the so-called permanganate oxidation method of Loewenthal. This method has a number of serious drawbacks. Chief among these is the fact that the method cannot be used for comparing two different tannin mordants; for example, a sumac mordant and a catechu mordant, but only those mordants that contain the same tannic acid. Furthermore, the raw tannin material contains other substances which are oxidized by the permanganate solution and in order to obtain an idea of how much tannin there is present in the raw product, it is necessary to determine the total oxidizable matter as well as the tannin content by precipitation with hide powder or gelatine. Other difficulties are the exact ascertaining of the correct end point of the titration, which is accurate only within one per cent tannin when the analyzed material contains 40 per cent or more tannin. Furthermore, there is the fact that the difference in color depth between two tannin materials of the same species is due in most cases to a difference in oxidation.

However, the use of the hide powder method of the tanner does not give results which have any real value to the dyer, for he is not concerned with the ability of the tannin to form leather. He wants to know just how the tannin will be absorbed by cotton or silk and how it will act when fixed on the fibers in the dyeing and printing process. There is quite a difference between the value of a tannin material to the leather man and to the dyer, and while the hide powder method of testing tannin materials affords the tanner what he wants to know about the value of these materials for his purpose, it does not give the dyer similar information. Investigations have been made, which indicate clearly that there is quite a difference between the value of tannin materials as mordants and as leather tanning agents. A number of common tannin materials were analyzed by the hide powder method, and it was found that pure tannic acid contained 85 per cent tannin, pure sumac extract crystals 56 per cent tannin, liquid chestnut 30.5 per cent tannin. Solutions of these and other similar tanning materials were then made up so that each solution contained exactly the same amount of tannin. Then a piece of clean bleached cotton cloth, thoroughly wetted beforehand, was placed in each solution. After the cotton cloth had remained therein for twelve hours, the pieces were taken out, rinsed separately in running water, and fixed all together with a solution of ferric sulphate. Then all were well washed and dried.

The results that were obtained in this manner showed that there is a very wide difference in the effects that different tannins have on cotton cloth and that the mere percentage of tannin in the tannin materials, as determined by the hide powder method, is no criterion of the value of the material as a mordant. A variety of different shades were obtained, especially in the case of sumac and chestnut. The amount of iron that is retained by the fiber was determined in each case and it was found from these results that the percentage of iron bore a definite relation to the depth of the shade obtained. Thus, the deeper the shade, the more iron is fixed on the fiber. Sumac was found to fix more than six times as much iron as valonia and about three times as much iron as chestnut. Further investigation led to the conclusion that there were two forces at work, which caused these differences to take place. In the first place, cotton itself apparently possesses a selective action on different tannins, absorbing more of some than of others; in the second place, different tannins fix different quantities of iron which vary with the particular character of the tannin.

## The Schroeder Variation of the Lowenthal Method

The Lowenthal method is still probably the best method for analyzing tannin mordants in the textile laboratory. The original process is based on the oxidation of the tannin by means of a solution of permanganate of potash with the aid of a solution of indigotin as an indicator. Being a volumetric process, it is rapid and when a certain amount of care is taken in its application, the results obtained with it are accurate within definite limits. There have been various modifications and improvements of this process, such as the Rawson modification, the Proctor method, the Hunt method, etc., but all of these methods do not vary very much in detail and the underlying principle remains the same.

In the German textile plants the Schroeder variation of the Lowenthal method is used, and it will be interesting to give a description of the details of the method and of

the results that are obtained with it. The necessary solutions are first permanganate of potash, which is made by dissolving 10 grams of the chemically pure salt in six liters of distilled water. Then there is a solution of indigotin, which is used as an indicator and which is made by mixing 4 grams of pure Badische indigo with 50 grams of chemically pure concentrated sulphuric acid and heating the mixture on the water bath for about one hour. The mixture is then diluted with distilled water, a maximum of 1,100 cubic centimeters of water in all. When this solution has been thoroughly cooled, 200 grams of chemically pure sulphuric acid of similar concentration are added and the entire mixture is then filtered into a measuring flask.

### Testing the Indigo Solution

About 10 to 11 cubc centimeters of the solution of potassium permanganate should be required to oxidize about 20 cubic centimeters of the indigo solution. In the standardization of the solution, and before each titration, when the indigo solution is tested with permanganate, 20 cubic centimeters of the former are diluted with 750 cubic centimeters of distilled water. The test is made in a large porcelain casserole. If the indigotin solution, which has been prepared beforehand, does not possess the correct strength, then it must be diluted and tested over again. The indigotin solution possesses the correct strength, when 20 cubic centimeters of the solution will reduce 10.7 cubic centimeters of potassium permanganate solution.

In the Schroeder method it is also necessary to use hide powder. This must be white, absolutely pure and must not yield any products, when dissolved in cold water, which are able to reduce permanganate. A blank test which is carried out with about three grams of hide powder will determine the reducing properties of the hide powder.

### Details of the Titration Method

The first step is to standardize the permanganate solution. About two grams of air dried tannin is mixed with exactly one liter of distilled water at 15 deg. Cent. in a liter flask. Then 10 cubic centimeters are pipetted into a large porcelain casserole. There are then added 750 cubic centimeters of distilled water at 15 deg. Cent. and 20 cubic centimeters of the indigotin solution. (The quantity of permanganate which is reduced by this volume of indigotin has been determined beforehand.) The permanganate solution is filled into an accurate burette and is allowed to flow nto the solution, prepared as above, until a greenish color appears in the same. The permanganate solution is added, one cubic centimeter at a time. From this point the permanganate solution is added, two or three drops at a time, while the tannin solution is constantly stirred, until the solution becomes golden yellow in color with a reddish tint, which is noticeable around the edges of the evaporating dish. After the volume of permanganate added has been read off the burette, about 50 cubic centimeters of the same tannin solution are placed in a large Ehrlenmeyer flask and there are added three grams of hide powder, which has been previously softened by boiling for two to three hours in distilled water. The water is removed as far as possible from this powder, before the latter is added, by pressing the powder between sheets of filter paper. The mixture is then allowed to stand in the closed Ehrlenmeyer flask for a period of eighteen to twenty hours after three drops of chloroform have been added. Then the solution is filtered and a ten cubic centimeter sample is titrated as described above. Tannin is used for the standardization when the permanganate consumption in the hide powder filtrate does not amount to more than 10 per cent of the total consumption of permanganate.

About two grams of the same tannin are used for the determination of the moisture content by drying the same on weighed watch glasses in an air bath at a temperature of 94 to 100 deg. Cent. The strength of the permanganate solution is calculated on the basis of gallo-tannic acid by multiplying the dry weight of the tannin, corresponding to one cubic centimeter of the permanganate solution, by the factor 1.05.

If it is assumed that the moisture content of the tannin is 10 per cent, then 10 cubic centimeters of the 2 per cent solution contain 0.018 gram of tannin. If 8 cubic centimeters of the standard permanganate solution are required to oxidize that amount of tannin, then the weight of tannin corresponding to one cubic centimeter of permangate is given by the following: 0.018 ÷ 8 or 0.00225, which when multiplied by 1.05 gives 0.0023625 as the gallo-tannic acid value of the permanganate solution.

### Preparation of the Tannin Extracts

The extracts are dissolved in hot distilled water and the solutions are filtered when necessary. When the crude tannin materials are analyzed, they are first boiled with distilled water so as to extract the tannin, and then the extracts are analyzed. About 20 grams of the crude tannin material are used for analysis, when the tannin content is 5 to 10 per cent, 10 grams for a tannin content of 10 to 20 per cent and 5 grams for a higher tannin content. It is advisable in general practice to make up the tannin solution in such a manner than a ten cubic centimeter sample will not require more than eight cubic centimeters of the permanganate solution for complete oxidation.

When analyzing sumac leaves, ground up gallnuts or other tannin materials in a finely comminuted condition, the samples are placed in a porcelain dish and 300 cubic centimeters of cold distilled water are poured over the powder. The mixture is then heated up and cooked for about one hour, the evaporated water being replaced with new water from time to time to keep the volume at its original point. Then the solution is filtered. This is best

done through glass wool, while as much as possible of the extracted tannin material is left behind in the porcelain dish. It is best to filter directly into a liter measuring flask. Then the glass wool is placed in the dish with the tannin material and extracted a second time with the same quantity of cold distilled water. The solution is filtered again. The cooking process is repeated once more and the solution is filtered. This treatment extracts all the tannin from the raw product. To test the completeness of the extraction, it is advisable to heat up the raw product with water a fourth time and test the solution obtained with gelatine solution.

The extracts are made up to a volume of exactly one liter. In extracting catechuic-tannic acid, the entire sample of catechu is mixed with one liter of water and is digested for two to three hours in a large porcelain evaporating dish, whereat all the soluble matter goes into solution. Then the volume is brought back to one liter. This is done in a liter measuring flask, and then there are added about 20 to 30 grams of pure barium sulphate, which does not yield any products in solution which are of an effect on the permanganate. This is for the purpose of clearing up the solution, which takes place after it has remained overnight in contact with the heavy spar. Ten cubic centimeters samples are taken for analysis. Besides that, 50 cubic centimeters are used for testing with 3 grams of hide powder, as described above in the process of standardization. After the solution has been allowed to remain in contact with the hide powder for the specified time, ten cubic centimeters of the filtered solution are used for analysis. The difference between the number of cubic centimeters of the standard permanganate solution, consumed in the first titration and that consumed in the second titration, yields a figure, which must be multiplied by the standard of the permanganate solution.

### Determination of Tannin in Gallnuts (Ground)

The following example of the analysis of a ground sample of gallnuts to determine the percentage of tannin in them will serve to indicate the manner of making the calculations. The weight of the sample was 5.6460 grams. An extract of the gallnut sample was made as indicated above, and 10 cubic centimeters of that extract required 28.45 cubic centimeters of the standard permanganate solution in the first titration. Then another 10 cubic centimeters sample of the extract, after it had been subjected to treatment with hide powder, required 8.45 cubic centimeters of the standard permanganate solution. The difference, 28.45 —8.45, or 20 cubic centimeters, is then multiplied by 0.0011834, which is the amount of gallo-tannic acid that is equivalent to one cubic centimeter of the standard permanganate solution. Consequently, 20 cubic centimeters of the solution are equivalent to 0.00236680 grams of gallo-tannic acid.

There are therefore 0.00236680 grams of tannic acid in ten cubic centimeters of the gallnut extract; then in a liter of the extract there are 2.3668 grams of gallo-tannic acid. But this liter of extract was obtained from 5.6460 grams of the original tannin material. Therefore, by solving the proportion 5.6460 : 2.36680 :: 100 : x, it is found that the crude tannin contained 41.91 per cent of gallo-tannic acid. A third titration indicated that there were required 10.5 cubic centimeters of the potassium permanganate solution for the titration of 20 cubic centimeters of the solution of indigotin. This corresponds closely with the standard figure, given above, and indicates that the standardization of the solutions was accurate.

### Standardization of the Permanganate Solution Against Tannin

As explained above, the permanganate titration was carried out against a solution of tannin. If there were required for this titration 19.8 cubic centimeters of the permanganate solution, then the net amount used for titrating the ten cubic centimeter sample of the 2 per cent pure tannin solution is 19.8 — 10.5 (the consumption due to the indigotin solution), or 9.8 cubic centimeters of potassium permanganate solution. The dry weight of the chemically pure tannin is found in the manner described above. Then the standard of the permanganate solution is to be calculated in such a manner that the dry weight of tannin, corresponding to one cubic centimeter of the permanganate solution, is multiplied by the factor 1.05.

For example, let it be assumed that the moisture in the tannin is 10 per cent. Then each ten cubic centimeters of the tannin solution will contain 0.018 gram of dry tannin. There were used for this volume of the tannin solution 8 cubic centimeters of the permanganate solution. Then the weight of dry tannin corresponding to one cubic centimeter of the permanganate solution is given by the quotient, 0.018 ÷ 8 or 0.00225 × 1.05 = 0.0023625 gram as the gallo-tannic acid value, corresponding to one cubic centimeter of the permanganate solution. When the tannin was dried to constant weight it was found to contain 12.24 per cent moisture.

### Calculation of the Standard

For example, let it be supposed that there were required 39.4 cubic centimeters of the standard permanganate solution for the titration of both the tannin and the non-tannin substances in the first test. Then after the tannin substances were precipitated with hide powder, it was found that 22.2 cubic centimeters of potassium permanganate solution were required for the titration of the non-tannin materials. Then the difference between 39.4 and 22.2 cubic centimeters or 17.2 cubic centimeters represent the consumption of permanganate solution due to the tannin has already been determined to be 12.24 per cent, so that two grams of pure tannin contains 87.76 per cent dry weight or 1.7552 grams and in ten centi-

meters of the tannin solution, there are consequently 0.017552 gram of the dry tannin, when two grams of the original tannin solution were made up into a liter solution. The figure 0.017552 is then divided by 9.3, the result obtained in the titration, described above. The quotient is 0.0018 and this figure is then multiplied by the factor 1.05. The result is 0.001890, which is the standard of the permanganate solution, when the pure tannin contains 12.24 per cent water. This factor is used in all further calculations.

It is unnecessary to give any further details on the calculations that are carried through in the various analyses of tannins. They involve simple mathematical processes, which offer no difficulties.

### Other Analytical Methods

There are other ways in which the permanganate titration may be carried out. Thus gelatine may be used in the place of hide powder. The permanganate solution may be standardized against pure ferrous ammonium sulphate or oxalic acid and then calculated back on the basis of tannic acid. It is possible to determine the tannic acid by direct precipitation with ammoniacal copper sulphate solution after preliminary treatment with sulphuric acid. Then there is the process of direct precipitation with gelatine, which possesses a serious disadvantage in the difficulty of settling the precipitate formed. The direct precipitation method with solution of tartar emetic is also open to the same objection.

### Qualitative Tests of Tannins by Dye Trials

It must be remembered that no matter what method is used for the quantitative determination of the percentage of active tannin principle in a crude tannin, this analysis must be followed up with qualitative dye tests. The general method of making these tests is as follows: Solutions are made of each tannin material, so that there are about 0.3 gram of tannin acid in half a liter of the extract. Tannin extracts, containing more than this amount of actual tannin, must be diluted. All the extracts and solutions will therefore contain equal amounts of tannin.

The calculation of the amount of crude tannin to use to obtain such solutions follows. For example, actual analysis showed that a certain Sicilian sumac (leaves) contained 16.01 per cent gallo-tannic acid. The analysis of a sumac extract showed on the other hand a content of 22.69 per cent tannic acid. In order to obtain solutions of equal tannic acid content, when we consider the content of tannic acid in one liter of the extract, it is found to be 1.56208 for the sumac extract and 0.852048 for the sumac leaves. Then the adjustments to be made are determined from the following proportions:

$$0.852048:1{,}000::0.3:x,\quad 1.56208:1{,}000::0.3:x$$

The factor x gives the number of cubic centimeters of water that are to be added to bring the volume of the solution or extract up to the 500 cubic centimeter mark. The solution will now contain exactly 0.3 gram of tannic acid in the 500 cubic centimeters.

The tannin solutions are now heated in porcelain beakers especially made for this purpose up to a temperature of 90 deg. Cent. and then a skein of unbleached cotton is added to each solution. The skeins are thoroughly impregnated with the tannin solutions and then the solutions are allowed to cool and remain overnight in contact with the cotton skeins. In the morning the skeins are rung out dry and then they are dipped into a solution of iron nitrate, specific gravity 1.01-1.02 (1.05 to 3 deg. Be.). At first the skeins are manipulated with the glass rods very vigorously, then they are allowed to remain in the solution, and later they are given the same treatment over again, at period of thirty to sixty minutes. The skeins are then wound up again and dipped into the solutions of the tannins once again. They are then wound up and dried. In certain cases the cotton skeins, which have been treated in this manner, are colored with logwood solution. All skeins are given this dye treatment, unless they are already dyed. The dye bath contains 20 to 30 per cent of logwood, figured on the weight of the goods. The bath is slowly heated to boiling and the skeins are subjected to the dye treatment for about one hour. Then the skeins are wound up and dried. After the dyeing it is advisable to treat the skeins in a bath of boiling hot bichromate of potash. The strength of this solution is 0.5 gram of the salt in a liter of water. After the cotton skeins have been allowed to remain in this solution for one hour, they are passed through a hot soap solution and dried. The tannin can be fixed on the fiber by means of iron acetate in the place of iron nitrate. The depth of the color in the yarns is then compared to obtain the relative value of the different tannins.

Another method of making practical dyeing tests with the tannins is described as follows: Hanks of unbleached cotton are mordanted in various tannin solutions, prepared as above. Each hank weighs ten grams. The skeins are wrung out thoroughly and then treated in a solution of tartar emetic, at a temperature of 30 to 60 deg. Cent. The solution of tartar emetic contains 0.5 to 1 per cent tartar emetic, calculated on the weight of the cotton hanks. The treatment lasts half an hour, and then the skeins are wrung out and carefully washed. If necessary the mordant treatment is repeated and the skeins are fixed again in the tartar emetic bath. The hanks of cotton, which have been mordanted in this manner, can be dyed with basic dyestuffs, such as malachite green, fuchsine, auramine, vesuvin, etc. The strength of the dye bath is one of the dye to 1,000 parts of water. The dye baths are made with half a liter of distilled water. Three strengths of dye bath are made up. The first contains 20 cubic centimeters of the dye solution to 480 cubic centimeters of water, the second 40 cubic centimeters of the dye solution to 460 cubic centimeters of water and the third 80 cubic centimeters of the dye liquor to 420 cubic centi-

meters of water. The hanks are treated in these dye baths, first in the cold, then slowly heated to a temperature of 50 to 60 deg. Cent. during a period of forty-five minutes, until the dye bath is exhausted. The skeins are wound up, washed and dried.

### Dye Tests with Catechu Colors

Solutions of catechu are made in the strength of 1:100 and in certain cases in the strength of 5:100. The catechu is digested in a dish for two to three hours and after cooling is transferred to a measuring flask, which is then filled to the liter mark with distilled water. One hundred cubic centimeters of this solution are used as sample and diluted with distilled water until it equals half a liter. Then the solution is heated up to 90 deg. Cent. Hanks of cotton, weighing about 10 grams each, are treated for one hour long in this bath. After the skeins have been wound up, they are immersed in a bath which contains 5 per cent of bichromate of potash, calculated on the weight of the cotton. The skeins are allowed to remain in this bath at a temperature of 80 deg. Cent. for a period of 45 minutes and then each one is treated again in the catechu for one hour long. They are then washed and dried. From the depth of the color there is obtained an idea of the relative value of the tannin materials.

# Foreign Dyes Imported Through the Port of New York During March

**Compiled by the Chemical Division of the Bureau of Foreign and Domestic Commerce, in Collaboration with the Chemical Division of the United States Tariff Commission**

## KEY TO ABBREVIATIONS FOR FOREIGN MANUFACTURERS

**1—The Six Leading German Companies**

A—Actien-Gesellschaft fur Anilin-Fabrikation, Berlin. Founded 1873. Branches in France and Russia.
B—Badische Anilin-und Soda-Fabrik, Ludwigshafen on the Rhine. Founded 1865. Branches in France and Russia.
By—Farbenfabriken vorm. Friedr. Bayer & Co., Leverkusen on the Rhine. Founded 1862. Branches in France and Russia.
C—Leopold Cassella & Co., Frankfort on the Main. Founded 1870. Branches in France and Russia.
K—Kalle & Co., A. G., Biebrich on the Rhine. Founded 1870. Branches in Russia.
M—Farbwerke vorm. Meister Lucius & Bruning, Hochst on the Main. Founded 1862. Branches in France and Russia.

**2—The Seven Smaller German Companies**

BK—Leipziger Anilinfabrik Beyer & Kegel, Furstenberg near Leipzig. Founded 1882.
GG—Chemikalienwerk Greishem G.m.b.H., Griesheim on the Main. Founded 1881.
CJ—Carl Jager G.m.b.H., Anilinfarbenfabrik, Dusseldorf. Founded 1823.
GrE—Chemische Fabrik Griesheim-Electron, Offenbach on the Main. Founded 1842.
L—Farbwerk Muhlheim vorm. A. Leonhardt & Co., Muhlheim on the Main. Founded 1879. Branch in France.
tM—Chemische Fabriken vorm. Weiler ter Meer, Uerdingen on the Rhine. Founded 1877.
WD—Wulfing, Dahl & Co., A. G. Barmen. Founded 1842.

**3—Dutch, Belgian and French Companies**

FA—Farbwerk Ammersfoort, Ammersfoort, Netherlands. Founded 1888.
NF—Niederlandische Farbe-und Chemikalienfabrik Delft, Netherlands (Delft). Founded 1897. Branch in Russia.
LG—Lazard Godchaux, of Brussels. (These products are probably compounded largely from the dyes made by A. Wiescher & Co., of Haeren, Belgium.)
P—Societe Anonyme des Matieres colorantes et produits chimiques St. Denis (formerly A. Poirrier), St. Denis, near Paris, France. Founded 1830.

**4—Swiss Companies (all at Basel)**

DH—Farbwerke vorm. L. Durand, Huguenin & Co. Founded 1871. Branches in Germany and France.
G—Anilinfarben-und Extract-Fabriken vorm. Joh. Rud. Geigy. Founded 1764. Branches in France, Germany and Russia.
I—Gesellschaft fur chemische Industrie. Founded 1885. Branch in France.
S—Chemische Fabrik vorm. Sandoz & Co. Founded 1887.

**5—English Companies**

ClCo—The Clayton Aniline Co., Ltd., Clayton, near Manchester. Founded 1876.
CR—Clauss & Co. (formerly Clauss & Ree), Clayton, near Manchester. Founded 1890.
CV—Colne Vale Chemical Co., Milnsbridge, near Huddersfield.
RHS—Read Holliday & Sons, Ltd., Huddersfield. Founded 1820. (Purchases by British Dyes, Ltd.)
BD—British Dyes, Ltd. Founded 1915.
Lev—Levinstein, Ltd., Crumpsall Vale, near Manchester. Founded 1864.
O—Importations of unknown source, through dealers in colors.

IMPORTS of coal-tar dyes for March totaled 312,809 pounds, with an invoice value of $301,436, compared with 191,709 pounds, with an invoice value of $199,640, for the month of February. The total imports for 1921 were 3,914,036 pounds, with invoice value of $5,156,779. Of the total quantity imported in March, 1923, 66 per cent came from Germany, 18 per cent from Switzerland, 12 per cent from Italy, and the remainder from Canada, France, England and Holland. Imports from Italy appear to be reparation dyes of German manufacture.

The dyes in this report are grouped by Schultz numbers, and in the case of those which could not be identified by Schultz number the classification according to ordinary method of application was adopted. As the pastes and powders of the vat dyes vary widely in strength and quantity, each vat dye has been reduced—in nearly every case—to a single-strength basis.

The designation (*) for non-competitive and (†) for competitive indicates the appraisement basis for the assessment of the ad valorem duty in paragraph 28 of the Tariff Act of 1922.

The ad valorem rate for competitive dyes is based on the American selling price, as defined in subdivision (f) of Section 402 of Title IV; the ad valorem rate for

(*Continued on page* 330.)

# Proceedings of the American Association of Textile Chemists and Colorists

## The American Association of Textile Chemists and Colorists

*President*
LOUIS A. OLNEY
Lowell Textile School, Lowell, Mass.

*Vice-Presidents*
WILLIAM D. LIVERMORE WILLIAM H. CADY

*Secretary*
WALTER E. HADLEY
5 Mountain Avenue, Maplewood, N. J.

*Treasurer*
WINTHROP C. DURFEE
516 Atlantic Avenue, Boston, Mass

*Councilors*
ELMER C. BERTOLET GEORGE A. MORAN
ARTHUR E. HIRST WILLIAM K. ROBBINS
WILLIAM R. MOORHOUSE WALTER M. SCOTT

LOCAL SECTIONS AND THEIR OFFICERS

*Northern New England Section—*
Hugh Christison, Chairman, Arlington Mills, Lawrence, Mass.
A. K. Johnson, Secretary, Lowell Textile School, Lowell, Mass.

*Rhode Island Section—*
Ralph F. Culver, Chairman, Box 269, Providence, R. I.
Leslie L. Bamberger, Secretary, U. S. Finishing Company, Providence, R. I.

*New York Section—*
P. I. Wood, Chairman, Oriental Silk Printing Company, Haledon, N. J.
L. C. Lewis, Secretary, 95 Madison Avenue, New York City.

*Philadelphia Section—*
Robert E. Rose, Chairman, E. I. du Pont de Nemours & Co., Wilmington, Del
Elmert C. Bertolet, Secretary, Philadelphia Textile School, Philadelphia, Pa

### MARCH MEETING OF NEW YORK SECTION

The regular March meeting of the New York Section was held at Stewart's Restaurant, 30 Park Place, New York, on the evening of Friday, March 23.

Following an excellent dinner, the meeting was called to order by Chairman Wood, who introduced the speaker of the evening, Dr. Oscar R. Flynn, of the Waldrich Bleachery, Delawanna, N. J., whose remarks follow:

### USE OF TITANOUS CHLORIDE IN QUANTITATIVE DYE TESTING

**Value in Checking Dye Tests—Knecht's Method—Waldrich Modification—Use in Determination of Dye Equivalents**

By OSCAR R. FLYNN, *Textile Chemist*

Titanium, an element found widely distributed in clays and rocks, has found only meager application in the arts and sciences. It is one of the "ugly ducklings" of chemistry, which only recently has begun to sprout a few swan feathers. Like silicon, which it so closely resembles and with which it is apt to be found in the course of mineral analysis, it forms a dioxide which in the presence of water exhibits only very weak acidic properties; but, unlike silicon, it does show feeble basic properties which enable it to form a series of salts with the stronger acids, which, however, require a large excess of acid to prevent decomposition by hydrolysis.

It further differs from silicon in forming a series of trivalent salts, which, incidentally, are more stable in solution than the tetravalent salts. It is these trivalent salts with which we are principally concerned in the present paper.

Trivalent titanium acts in many respects like divalent tin, especially in its strong reducing properties. Titanous chloride is capable of reducing copper and iron to their lower states of oxidation; it reduces azo, nitro, and nitroso compounds to their corresponding amides, and quinones to their corresponding phenolic forms. Generally speaking, dyes are reduced to their leuco forms, or, where such forms do not exist, are split into various amido bodies, as in the case of the azo dyes; in the case of the triphenyl methane dyes there is also evidence of the reduction being carried beyond the leuco state.

Published accounts show that Prof. Edmund Knecht was the first to make use of titanous salts in the quantitative estimation of dyes. He first published his method about twenty years ago and completely summarized it in a monograph about thirteen years ago ("New Reduction Methods in Volumetric Analysis," by Knecht and Hibbert).

#### PROF. KNECHT'S METHOD OF PREPARING, STORING, AND MEASURING TITANIUM SOLUTIONS

Prof. Knecht made use of a commercial 20 per cent solution of titanous chloride, which may still be ob-

Proceedings of the American Association of Textile Chemists and Colorists

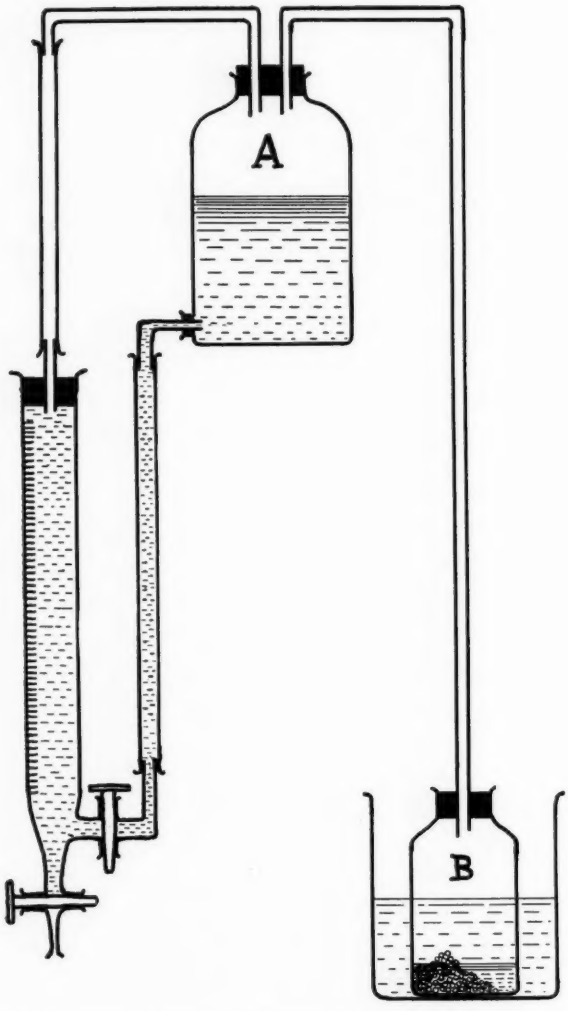



FIG. 1—*Prof. Knecht's Apparatus for Storing and Measuring $TiCl_3$. A: reservoir containing 1 per cent $TiCl_3$ solution protected by atmosphere of hydrogen. B: hydrogen generator containing Zn supplying hydrogen under slight pressure*

tained. This he diluted to an approximate 1 per cent solution, which was stored in a convenient reservoir in an atmosphere of hydrogen, from which it was drawn into a side outlet burette from which measured quantities could be delivered without undue exposure to the air. The general arrangement of this apparatus is familiar to the majority, but for the sake of completeness it is shown in *Fig.* 1.

### STANDARDIZATION OF SOLUTION

In the original method, the titanous solution was standardized with ferric salt made from a weighed quantity of pure ferrous ammonium sulphate by careful oxidation with permanganate in the presence of acid. Sulphocyanide was used as an indicator, and it is stated that this could be added directly to the ferric solution.

### TITRATION OF DYES

Different methods were used, according to whether the dye in question did or did not separate from solution in the presence of acid.

Where the dye was soluble in acid, as is the case with many of the so-called acid dyes, the titanium chloride was added directly to the dye solution (protected by a stream of carbonic acid) until the disappearance of the dye color marked the complete reduction of the dye.

Where precipitation took place, it was found convenient in many cases to add at once an excess of the reducing solution, titrating back with a ferric solution previously standardized against the titanous solution, and using sulphocyanide or reduced Methylene Blue as an indicator.

In other cases, precipitation was prevented by use of alcohol or Rochelle salts, or both, so that the titration could be carried out directly. Rochelle salts, in fact, seem to have a catalytic effect and react favorably even where no precipitation took place.

### CALCULATION OF RESULTS

In the case of Crystal Ponceau 6R, a dye formed by coupling G salt with diazotized alpha-naphthylamine, the results of direct titration are shown in the following table:

| Grams, Sample | Grams, Pure Dye | C.C., $TiCl_3$ Sol. | Grams, Hydrogen | Grams, Iron in Ferric Condition |
|---|---|---|---|---|
| ... | 502 | 141,800 | 4 | 224 |
| 0.100 | $\frac{502 \times 22.6}{141,800}$ (0.080 approx.) | 22.6 | ... | ... |

One hundred forty-one thousand eight hundred cubic centimeters of titanous solution were found to be capable of reducing 224 grams of iron in the ferric condition to the ferrous condition. This makes the reducing value of the 141,800 c.c. of the solution equal to 4 grams of hydrogen, the amount required to convert one azo

**Proceedings of the American Association of Textile Chemists and Colorists**

group of 28 grams of nitrogen into the amido condition. In other words, the quantity of titanous chloride named reduces 1 gram molecule of monazo dye, which in this case is 502 grams of Crystal Ponceau 6R. As one-tenth gram of the dye sample required 22.6 c.c. of the titanous solution for reduction, the calculation shows that the tenth gram contained approximately 0.8 gram of pure dye, or is about 80 per cent pure anhydrous dye (the non-dye material in this case being water of crystallization).

### Accuracy of Results

It is generally conceded that Knecht's method of titration is an accurate means of estimating the quantity of azo dye present in a mixture of dye and non-reducible substance, such as salt or moisture. Like all methods of quantitative analysis, everything depends upon the qualitative examination, which insures the absence of materials which interfere with the determination.

Where dyes of doubtful purity are under examination it is only the part of wisdom to make the usual "blow-out" on water and acid to make certain that a deliberate mixture is not being dealt with. This would naturally be done away with before making the customary quantitative dyeings.

It is claimed, however, that in some of the more complicated direct dyes, notably blacks and browns, the presence of simpler azo products not capable of dyeing cotton and formed accidentally interfere by their presence with a proper valuation of the dye by this method. The presence of chrysoidine in direct black is a case in point. It has occurred to me that when in the examination of direct dyes a discrepancy is noted between the results of dyeing and the titanium titration, that the sample to be tested might be purified by washing on a Gooch asbestos filter with a solution of salt and acid capable of dissolving the low molecular azo dyes present as accidental impurities, without at the same time dissolving the high molecular weight direct dye.

### Waldrich Adaptation of Knecht's Method

In our work at the Waldrich Bleachery, the titanium titration is used as a check on regular dye tests and at the same time to obtain a clue as to the proper proportions to be used in making equal shade dyeings. These and the qualitative examinations furnish the evidence for selection on basis of quality and money value.

Instead of titrating the dye with the titanous solution, we turn this around, titrating the titanous solution with the dye. We use a standard dye of the kind being tested for comparison, the results being recorded in terms of this standard dye. By so doing we obtain at once the information needed and make it unnecessary to standardize or keep on hand a standard solution of the titanous salt.

### How We Prepare and Store Titanous Solution

The titanous solution is prepared from commercial titanium potassium oxalate by transposition with hot sulphuric acid in a porcelain dish (which takes only a minute), reduction with zinc dust in presence of water and hydrochloric acid, filtration while in a strongly effervescent condition into a bottle containing a quantity of castor oil, which covers and protects the solution from oxidation. If in use the solution is found inconveniently strong it is diluted roughly until the convenient quantity measured for a determination is found to be oxidized by less than a burette full of dye.

The castor oil deserves some especial emphasis, as it is the only cheap immersible liquid which furnishes adequate protection from the oxygen of the air. This is probably due to its viscosity and perhaps to some specific inability to dissolve oxygen.

### Method of Carrying Out the Titration

When a determination is to be made, two portions of the titanous solution are withdrawn from the bottle

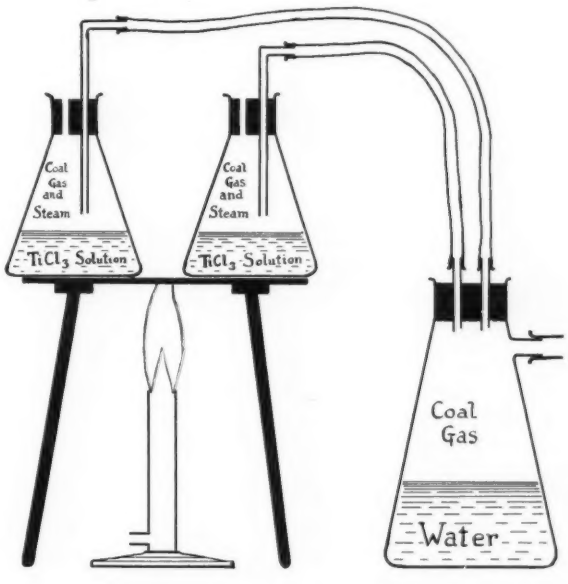



Fig. 2—*Apparatus Used in Waldrich Adaptation of Knecht's Method*

by means of a pipette and introduced into the titration flasks previously filled with steam and coal gas. The arrangement of these flasks and the method by which they are kept filled with coal gas and steam, while at the same time permitting the introduction of liquids for the determination, can be understood from *Fig.* 2.

The titration is carried out by running the dye solutions into the flasks through the opening through which the titanous solution is introduced. To facilitate this, the ends of the burettes are provided with thin jets fastened in place with couplings of thin rubber tubing. In carrying out the titrations the burettes are held by hand and additions made alternately, first to one flask and then to the other; as far as possible the color in the two flasks is kept the same. When the titanous solution in the flasks has been completely oxidized, as shown by the persistence of the dye color, a final addition is made to one flask or the other to make the color in the two flasks exactly match, and the relative strength of the two dyes is read off in the number of cubic centimeters used. This is calculated into equivalents based on the standard dye as unity.

Any convenient strength of dye may be used in these comparisons; 2 grams to a liter is found to work well in most cases.

### Examination of Sky Blues

In a series of sky-blue determinations made at various times and with different titanous solutions the following results were achieved:

| Chicago | Rochester | Washington | Phila. | Manhattan |
|---|---|---|---|---|
| 32.7 | 40.2 | .... | .... | .... |
| 36.2 | .... | 35.0 | .... | .... |
| 30.0 | .... | .... | 30.6 | .... |
| 27.3 | .... | .... | .... | 34.0 |

These are actual determinations or averages from several determinations; the names of the manufacturers are somewhat disguised, however.

From the above determinations the calculated equivalents are as follows: Chicago, 1.00; Rochester, 1.22; Washington, 0.96; Philadelphia, 1.02; Manhattan, 1.25.

Based on these equivalents, equal shade dyeings were prepared using one-quarter of the equivalent to represent the required percentage of dye for each kind of dye, viz.: Chicago, 0.25; Rochester, 0.305; Washington, 0.24; Philadelphia, 0.255; Manhattan, 0.31. These dyeings were found to be equal shade dyeings with one exception, that of the Manhattan dye, which dyed more strongly than was expected. We were therefore satisfied that our determinations were correct in all cases except for the Manhattan sky blue, which, of course, must be retested.

### Recording Results

The results of these determinations, as well as all other determinations, are summarized as shown in *Fig.* 3.

SKY BLUE

| | Equivalent | Price | Date | Cost of Equiv. |
|---|---|---|---|---|
| Chicago ..... | 1.00 | $2.00 | 2/1 | $2.00 |
| Rochester ..... | 1.22 | 1.60 | 2/2 | 1.95 |
| Washington ..... | 0.96 | 2.00 | 2/10 | 1.92 |
| Philadelphia ..... | 1.02 | 2.00 | 2/8 | 2.04 |
| Manhattan ..... | ... | 2.00 | 2/9 | ... |

Fig. 3

The summary card shows at once that of the dyes successfully tested, the Rochester sky blue is the best money value; also that in case the dyer has been using the Chicago sky blue he must use about 1 pound 3½ ounces of the cheaper dye for each pound of sky in his old formulas.

In conclusion, I wish to emphasize that we find the titanium method in the simplified form to be a most valuable adjunct to the method of testing dyes ordinarily used, and that in the great majority of tests we find no noticeable discrepancy between the dyeing test and the titanium tests. I might say further that we have confined its use exclusively to those direct dyeing azo colors actually in use in the plant, and perhaps on that account have failed to run into some of the difficulties encountered by others.

---

At the conclusion of Dr. Flynn's paper there was general discussion of the subject. Prominent among those who took part in the discussion were A. E. Houlehan, of the Jackson Laboratory of E. I. du Pont de Nemours & Co., Wilmington, Del.; H. F. Herrmann, of the National Aniline & Chemical Company, and C. M. Edward Schroeder, of Rutherford, N. J.

At the request of the secretary these gentlemen consented to summarize their remarks for publication, and they are appended below as prepared by their respective authors:

*Mr. Houlehan*—The method Dr. Flynn has just described to us for the analysis of dyes by means of ti-

tanium trichloride is very interesting. By titrating the dyestuff solution into the titanium trichloride solution there is practically instant reduction and it is not necessary therefore to maintain a constant acidity. In the original method as described by Knecht where the titanium chloride was added to the dye solution, there was a gradually building up of the acidity so that decomposition would occur. To prevent this he employed sodium tartrate as a buffer.

Dr. Flynn stated that he employs $TiCl_3$ in conjunction with dye tests in determining the money value of dyestuffs which they purchased. In this connection I would like to call your attention to an article by Dr. Rose in a recent issue of the Color Trade Journal in case you have not already read it, which points out the dangers in the use of the titanium trichloride method for determining the strength of dyes. In practically no case can you depend solely on the value as indicated by titanium trichloride. The reason for this is, of course, quite obvious, since the accuracy of this method depends upon the absence of bodies capable of reduction other than the particular dyestuff itself. Titanium trichloride has the widest application in the determination of the azo group. Unfortunately, azo dyes on account of their complexity and the nature of the method of their manufacture are most likely to have present products other than the dye itself that are capable of reduction. These products in most cases have no effect on the application of the dye on the fiber. Where you have a thoroughly standardized manufacturing process and there are purification steps in the process it is possible that the titanium trichloride value will be quite accurate.

The only dye we have been able to analyze with titanium trichloride with confidence is Indigo. In this case the method has been found extremely accurate and is much more convenient to carry out than any of the other methods commonly employed.

The greatest value of titanium trichloride is its use as a check on the dye test. With any given sample of a dye the strength as shown by titanium trichloride can always be checked quite closely in determinations made at different times, although it may not necessarily give the true strength as the dye as applied on the fiber. This fact is of extreme usefulness in following the course of the standardization of a dye. In the standardization of a dye several charges are first selected and mixed thoroughly together, a sample is then taken and a dye test and titanium trichloride value is obtained so that the amount of diluent to be added can be determined. The standardizing agent is added and after thoroughly mixing a second sample is taken and it is again dye tested and titrated with titanium trichloride. Since the titanium trichloride determination on any given sample of dye follows accurately the dilution you can be sure the dye test is off unless the strength of the diluted dye as determined by dye test and titanium trichloride is in the same ratio as on the undiluted material. Titanium trichloride has so far only been found applicable to azo, certain triphenylmethane dyes and a few other isolated cases such as Indigo. We have not been able to use it with Sulphur and vat dyes.

It might be of interest to you to outline briefly the general method we employ for analysis with titanium trichloride since it is different from that given by Dr. Flynn.

In attempting to apply the method recommended by Knecht, difficulty was frequently encountered in the high color of the reduced solution which marked the end point of the titration. Investigation revealed the fact that this color depends to a large extent upon the nature of the medium in which the sample is dissolved so that by a proper choice of solvents the direct titration of a dye is made possible which otherwise would require the less convenient indirect method. Unfortunately, no means of predicting the required solvent mixture from the constitution of the sample has been established to date. Consequently in undertaking the analysis of a new dye the medium must be determined by trial. We have used water, alcohol, acetic or mixture of these as solvent. The data acquired in the analysis of a large number of azo dyes showed that any combination of solvents which yields a sharp end point gives concordant results of sufficient accuracy for ordinary purposes. When no combination of solvents can be found that will give a clear end point then it is necessary to add an excess of $TiCl_3$ and back titrate with standard ferric alum solution. From these considerations it is evident that no procedure of universal application can be given, the general outline of the methods employed being as follows:

### Direct Titration

Dissolve the sample, which should be equivalent to 30-50 c.c. of 0.05 N $TiCl_3$, in 50-100 c.c. of an appropriate solvent (water, alcohol, acetic acid or mixture of these) in a 300 c.c. Erlenmeyer flask, add 50 c.c. of 25 per cent $Na_2C_4H_4O_6.2H_2O$ solution and boil for three to five minutes. Admit a rapid stream of $CO_2$, connect the flask to the burette and titrate the hot solution with 0.05 N $TiCl_3$ to the last distinct color change. If the standard solution is added in 0.2 c.c. portions toward the end of the titration, a satisfactory end point can be detected in even a quite highly colored solution.

### Indirect Titration

Dissolve the sample (equivalent to about 30 c.c. of

$TiCl_3$) in 50-100 c.c. of solvent, add 25 c.c. of 40 per cent $H_2SO_4$ or concentrated HCl, boil to expel dissolved air, sweep with $CO_2$ and add 50 c.c. of 0.05 N $TiCl_3$. Boil five minutes and titrate the hot solution with 0.05 N ferric alum solution. It frequently happens that the reduction products of the dye serve as indicator, but if this is not the case 2 c.c. of a 0.1 per cent solution of reduced Methylene Blue should be added previous to the back-titration. This indicator is prepared by dissolving 0.5 grams of dye in 100 c.c. of 50 per cent alcohol and 50 c.c. of 25 per cent sodium tartrate solution, titrating hot with $TiCl_3$ to discharge the blue color and diluting to 500 c.c. The solution should be stored under $CO_2$, as it is rapidly reoxidized by air.

*Mr. Herrmann*—2. Dr. Flynn mentions specifically an instance where a direct green was reported satisfactory according to his analytical procedure and subsequently was found to be unsuited for discharge work because it left a yellow tint. This must undoubtedly have been due to the presence of Chloramine Yellow or a large percentage of Stilbene Yellow. The latter discharges in small quantities, but not perfectly when a considerable amount is present. Is it possible that titanous chloride will discharge colors which are not dischargeable with hydrosulphite, when applied in the manner for discharge printing? I should think that the presence of Chloramine Yellow, in particular, would show itself by a yellow coloration of the test liquor after the true green had been destroyed by the titanous chloride.

2. Titanous chloride indicates quantitatively the total amount of reducible dyestuff present in a given sample. It does not indicate accurately the quantity of desired or available dyestuff, from the dye's point of view. An instance at hand is Direct Blue 2B, which almost invariably contains a reddish by-product, presumably an acid color, resulting from impurities contained either in the Benzidine or H Acid. The presence of this reddish by-product may be established very simply by making capillary tests, or by attaching a small piece of silk to the ordinary cotton skein. The color which draws on the silk is of no interest to the cotton dyer, but is rated as dyestuff by titanous chloride.

Practically all blacks of the Direct Deep Black E type contain Bismarck Brown. Titanous chloride rates this by-product as Direct Black.

It is conceivable that uncombined intermediates remain in dyes to an appreciable degree. For instance, uncombined H Acid may be left in Direct Blue 2B. Titanous chloride would rate this by-product as available dyestuff.

The quality of a dye is not associated entirely with its concentration. Its purity of shade and freedom from objectionable by-products, and its solubility and dyeing properties are of far greater importance. The dyer can compensate for strength variations, but is confronted with a very serious problem when he has to deal with a product which does not dye correctly, discharge correctly, or does not have the shade of the standard. In the standardization of dyes, one is frequently confronted with batches which when dyed in distilled water at the boil yield the desired strength and shade, but because of inferior solubility, will not yield nearly the desired when dyed in water of ordinary hardness, or when dyed below the boil. Analyses conducted with titanous chloride or colorimetrically will rate such batches as of excellent strength, whereas the coloring power may not be available under practical conditions. Other dyestuffs are so excessively soluble that they do not exhaust out of the dye bath to the desired degree. I have in mind a blue dye which, in solution, appears at least 140 per cent in strength as compared with its standard, but which when dyed under ordinary conditions, yields a strength of only 90 to 95 per cent, the remaining color being left in the dye bath. Tests with titanous chloride, or with colorimetric apparatus, will rate this color as 140 per cent. The color which is actually absorbed by the fiber possesses the desired fastness, the color left in the dye bath is of an abnormal solubility, and does not dye. Practical tests are required to establish its presence, qualitatively as well as quantitatively.

Purity of shade is a very valuable asset to a dye and is a costly feature from the point of view of the dyestuff manufacturer. A Direct Sky Blue of very pure and vivid shade is deservedly more costly than a duller shade. A titanous chloride test does not bring out its clearer tone and therefore does not establish any reason for its higher price. Such samples would be eliminated without further consideration, purely on the basis of a somewhat higher cost, and corresponding poor money value as established by analytical tests only.

3. Titanous chloride essentially gives only the total reducible substance contained in any dyestuff sample. With dyes of high purity this total reducible matter may be taken as equivalent to available dyestuff. As previously explained, however, the tinctorial value of a commercial dye can be established only by actual dye tests, conducted along practical lines. Reducible substance other than dyes present in a sample may consist of uncombined intermediates as mentioned before, organic impurities, nitro compounds, etc., inorganic impurities, iron oxide, etc. I should like to ask Dr. Flynn what influence the presence of substantial amounts of Dextrine in a sample of dye would have. Dextrine is usually not added to direct colors for standardization purposes. It may, however, be present accidentally, or may be added deliberately in order to throw off a test of this character.

In conclusion, I wish to state that I have carried out a

number of experiments with titanous chloride but have the objection to this method that its results are too remote from actual application practice. There are so many features of a dyestuff which require observation and recognition, which must be accounted for in the rational testing of a dye, that the titanous chloride analysis is of secondary importance. In working out the qualitative valuation of a dye the quantitative valuation proceeds simultaneously and both results are obtained at the same time. I can appreciate the value of a titanous chloride titration for checking dilutions made during standardization, after qualitative and quantitative dye tests have established the quality of a dye and the need for such a reduction, but beyond this I do not believe that this method can be safely employed either for the standardization or the valuation of dyes.

*Mr. Schroeder*—I have listened to Dr. Flynn's paper with a great deal of interest and am pleased to note the attention that has been directed to the uses of titanium solutions in dye tesing.

While my own work with titanium has not been along the same lines, such references as came to my notice were of service in the research I took up several years ago for the utilization of titanium compounds from by-products of an electric smelting process for making titanium alloys at Niagara Falls.

At the time I found very little attention directed to the subject in this country, but in the writings of Dr. Knecht of Manchester, England, the value of titanous salts for reduction methods of analysis, was definitely shown.

As may be already known to many of you here to-night, the production on a commercial scale of titanous chloride and sulphate, for use in the textile coloring industries, has been carried on for several years by Spence & Sons, Manchester, England, and some of their product was being shipped to this country before the war, in solutions of 20 per cent concentration. This source, however, was shut off on account of war conditions, and I believe has not again been revived.

Under these conditions I considered the time opportune for exploiting our own titanium salts for textile application, but my clients did not wish to encourage development in this line at the time, as the full capacity of their first by-product plant was required for the production of a titanium oxide pigment, for making a permament white paint.

I might here explain that it is from this pigment process that we have our source of titanium salts, the first soluble compound obtained being a crude titanic sulphate, containing about 25 per cent of titanic oxide. This material is, of course, produced on a considerable tonnage basis, the plant having a rated capacity of thirty tons per day of pigment.

The thought struck me while Dr. Flynn was describing his method of obtaining titanium sulphate for preparing his reagent, that perhaps I could have saved him considerable trouble had I known of his needs, by sending him some of the Niagara Falls product. However, as we are not very distant neighbors in Jersey, I will offer to keep him supplied in the future.

In practical application the titanous salts must naturally come into competition with hydrosulphite, although not in all cases replacing them, particularly in the line of vat color preparation, which so far seems not to have been practicable.

In the form of 20 per cent solutions, as heretofere placed on the market, these products are the most powerful acid reducing agents known, in most cases replacing stannous chloride with advantage.

For printing, the titanous salts are useful either for discharge or resist work.

In clearing whites, as from bleeding or imperfect discharge work I know of a large mill near Passaic that has been for several years using weak solutions of titanous salts for this purpose very successfully.

For stripping dyed goods the salts may be used on cotton and silk, and to some extent on wool. My own experience in this line has been confined to cotton goods dyed with direct colors, large runs having been made in continuous machines.

Titanium is known also to have mordanting properties but I have no practical information on this point. I have, however, obtained some interesting results in the laboratory with both silk and cotton, in combination with tannic acid and tannin compounds.

This combination produces shades of yellow, orange and brown in the form of a lake, very fast and intense by itself, or serves as a bottom for other shades.

If the subject is of sufficient interest to the members, I might offer to present a paper before you at some future meeting, relating to the development of titanium products.

---

At the close of the discussion on titanous chloride a guest, H. Gardner McKerrow, exhibited a number of samples of printed fabrics done by a new process of lithographing on textile cloths which has recently been developed in England.

These fabrics included cotton, worsted and silk, as well as felt, and designs in any number of colors, and showing any degree of elaboration and minuteness of detail were shown.

The colors are claimed to be fast to ordinary washing and light tests. It is not claimed for the process that it can compete with regular cylinder printing, but it can be used where block printing is usually employed, and for special purposes where cylinder printing could not be profitably utilized such as small runs of special patterns for cushion covers, table covers, felt cash mats and various advertising novelties.

One interesting use shown was in printing on cloth the patterns shown by machine printers in sampling their trade, these patterns being produced in a very short time and at a comparatively small expense, thus obviating the great cost and the delay in engraving copper rollers for designs which may not catch the fancy of the market.

It is claimed that the process is very much cheaper, as well as being quicker, than any form of block printing. For any designs calling for cross borders, such as the new bandanna and Egyptian squares, which are such a feature in the present novelty market, the process would seem to be ideal.

L. C. LEWIS, *Secretary.*

## FEBRUARY MEETING OF RHODE ISLAND SECTION

The February meeting of the Rhode Island Section was held Friday, February 9, 1923. The meeting was called to order at 8.15 p. m. by the President, Mr. Culver. Following announcements, Dr. Richard B. Earle spoke on "The Use of Fat sand Oils in the Cotton Finishing Industry." The substance of his remarks follows:

Fats and oils are chiefly used in the cotton finishing industry for brightening colors, for aiding penetration of colors, as kier assistants, and for their softening properties. (The latter use was the chief topic of the talk.) Softeners are needed to give the particular feel to cotton goods desired by the customer. Bleaching is designed to remove, as far as possible, all impurities in the material and leave purified cellulose. Pure cellulose has a harsh feel, and as all the subsequent operations of dyeing and washing add no softness to the fiber it is customary to gain the desired hand by direct addition of fatty materials.

The chief oils and fats used for this purpose are: Castor oil, cottonseed oil, coconut and palm kernel oils, palm oil, olive oil, corn oil, tallow, wool grease, Japan wax.

These oils and fats are mixtures of oleine, palmitine and stearines with substances peculiar to the oil itself, such as laurine in the case of palm kernel and coconut oils. Wool grease is a very complicated mixture of wool waxes and cholesterines. Owing to the fact that these glycerides are common to all, the determination not only of the proportions but even of the nature of the fats which have been used in a softener is a matter of great difficulty and sometimes an impossibility.

As softeners, the best of all are the animal fats. Animal tallow is superior to coconut or palm oils, for example, as is neatsfoot oil to most of the vegetable oils. Coconut oil in particular seems to have an undeservedly high reputation as a softening agent, whereas in reality it is inferior and is more valuable as a soap than as a softener. The question of what fat or oil to use is a vexing one to answer, as the matter is complicated by their different degrees of solidity, best measured by the titer or solidifying point of the free fatty acids obtained on saponification. Some classes of goods are finished to a very soft, "raggy" feel, while others need a stiff finish, and still others need only just enough fat to counteract the sizing used. For an extremely soft finish wool grease is unexcelled, but it has the undesirable property of destroying the luster.

As softeners the raw fats are by far the best, having greater softness than the chemically altered fats that are generally used. In some cases raw fats are advantageously used, as in size mixtures which are stiff enough to prevent the fat from separating in drops. The problem of the softener maker is to mix oil and water, or, in other words, prepare colloid solutions of them. The softening process is purely a colloid chemical one, as are most processes connected with textile work. Dyeing is a colloid process; so is washing. Many of the dye solutions are colloid solutions. The speaker defined colloid solutions and recommended a reading of "Theoretical and Applied Colloid Chemistry," by Ostwald and Fischer, as the best introduction to the series of complex phenomena comprised by the term colloid chemistry.

Now, while these colloid solutions contain the fat in a very finely divided condition, it must be remembered they are only colloid solutions and the fat cannot diffuse into the interior of the fiber but remains on the surface of the cloth. The same is true of most dye solutions. Under certain conditions the fat will go onto the fabric perfectly evenly, but colloid solutions are not stable outside certain limits of alkalinity of acidity, and will separate into oil drops unless carefully used.

For preparing colloid solutions of the fats, they are either saponified or sulphonated, or both processes are combined. The oldest known method of preparing colloidal fat solutions is that of saponification. Olive oil emulsions prepared from the so-called Gallipoli oil,

a rancid olive oil, by addition of a small amount of soda ash were among the earliest of the softeners. To-day the best method of preparing colloidal fat solutions is by use of the process of sulphonation, giving as it does a much finer state of subdivision of the fat particles, with a correspondingly greater degree of penetration into the cloth. The first sulphonation mentioned is that of olive oil by John Mercer in 1846. About 1870 sulphonated castor oil appeared in the trade. This is the most important of the sulphonated oils, being used for many purposes besides softening. The apparatus used is simple: a lead-lined tank provided with thermometer and stirrer, and lead coils for cooling and heating. To the castor oil about 25 per cent of its weight of 66 deg. sulphuric acid is slowly added, the temperature being kept low; say, about 30 deg. Cent. After all the acid has been added, the mixture is usually allowed to stand overnight to complete the reaction. It is then stirred with warm waer or Glauber salt solution, allowed to settle, the aqueous layer drawn off and the upper layer neutralized with caustic soda till the free mineral acid is neutralized. After again settling, the lower layer is drawn off and the sulphonated oil neutralized with caustic soda until it dissolves nearly clear in water, and is then diluted to the desired strength. Sometimes ammonia is used for finishing the oil, but there are some objections to its use. A good sulphonated castor oil should give an almost clear solution in water and have a reaction, which is acid to phenolphthalein, alkaline to methyl orange and nearly neutral to litmus. As phenolphthalein is unreliable with ammonia, a poorly sulphonated oil can be made slightly alkaline and therefore more soluble in water by use of ammonia without giving much reaction with the indicator. The laboratory tests for quality may be confined to determining the percentage of total fatty matter, solubility in water and reaction. The determination of unsulphonated oil present is misleading. Sophistication of castor oil by other oils may be shown by the acetyl numbers, but it is preferable to buy from a reliable source. The reactions involved in sulphonation, or more properly sulphation, were given.

Another sulphonated castor oil preparation is the so-called doubly sulphonated oil. It is said to possess the advantage that it does not precipitate lime soaps as readily with hard water as does ordinary sulphonated castor oil, or at least that they precipitate in a more granular form. This oil is made by sulphonating a mixture of ricinoleic acid and about an equal amount of raw castor oil. The ricinoleic acid is prepared by boiling sulphonated castor oil several hours with water. A different percentage of acid is used, but the subsequent treatment is the same. Double sulphonation is a misnomer, and the speaker thought its advantages were largely fancied.

Other sulphonated oils were mentioned. Olive oil gives a good emulsion, but not a clear solution in water. Cottonseed oil is rather difficult to sulphonate and has no special advantages. Corn oil is easy to sulphonate and gives a very useful product. This oil seems to have an undeserved reputation for turning rancid. Neatsfoot oil makes a very good softener; it is one of the best oils for softening purposes.

A much used preparation is the so-called soluble textile oil. This contains much mineral oil, 50 per cent or more, and is used to give a soft feel to goods where the odor is not of prime importance. It is usually composed of a mixture of sulphonated fatty oils and petroleum oil. A good oil of this character should give a white emulsion with water which shows little or no separation of oil drops after the lapse of several days.

The most important softeners are those prepared from the solid fats, as tallow, palm oil, coconut oil, etc. Tallow is sulphonated with 15 to 18 per cent of sulphuric acid for a short period, about three hours at a temperature around 40 deg. Cent. The temperature must be high enough to keep the tallow liquid. It is finished much like sulphonated castor oil, diluted to from 18 to 30 per cent fat, and is a smooth white paste. The usual laboratory tests are determination of total fat and reaction to indicators. The best test of all softening agents is their behavior under actual working conditions.

In the case of castor oil, as mentioned, the sulphonation consists of a splitting off of water between the hydroxyl group of the ricinoleine and the sulphuric acid, forming an ether sulphuric acid which forms salts with alkalies which are soluble in water. They are not sulphonic acids in any sense. In the case of tallow the action consists in a direct addition of sulphuric acid to the double bond of oleines present, the double bond probably being unattacked with castor oil. The product from castor oil is unsaturated and from tallow is saturated. It is claimed some of the valuable properties of sulphonated castor oil are due to this fact. On boiling with water the soluble castor oil reverts to ricinoleic acid, whereas the sulphonated oleines of tallow form hydroxy stearic acid. The saturated fats, the stearines, present in tallow are not attacked by sulphonation except in so far as they are partially saponified, and are emulsified by the sulphonated portions. The sulphonated tallow does not, therefore, give an entirely clear solution in water.

The process of sulphonation is an ordinary organic

reaction and subject to the general law roughly expressed by the statement that the speed of reaction doubles for every increase of 10 deg. Cent. in temperature. There are the three variables of concentration of acid, time and temperature, and these may be adjusted according to the needs of the particular process. An unavoidable accompaniment of sulphonation is the splitting of oils and fats into free fatty acids and glycerine. All these sulphonated products contain, therefore, a varying amount of free fatty acids or soaps.

These softening preparations are used by dissolving in warm water and padding on to the cloth. Attention must be paid as to what other additions are made to the softener bath, because, as previously remarked, these colloidal emulsions are only stable under certain conditions of acidity and temperature, particularly so with soluble mineral oils, and if separation of the emulsion takes place spotting of the goods is inevitable. Acidity is very dangerous and softeners are often blamed unjustly for spots which are caused by improper size additions.

In conclusion the speaker discussed certain kindred topics, such as the acid saponification process used in soap making.

The talk closed at 9.30 p. m. and was followed by a brief discussion. The attendance was about eighty.

L. L. BAMBERGER, *Secretary.*

## MARCH MEETING OF RHODE ISLAND SECTION

The regular March meeting of the Rhode Island Section of the American Association of Textile Chemists and Colorists was held at the rooms of the Providence Engineering Society, 42 Washington Street, Providence, on March 15.

After opening the meeting, Chairman Culver gave the privilege of the floor to Mr. Franklin, of the Providence Engineering Society, who spoke briefly on the membership drive about to be conducted by the Engineering Society. Mr. Verity presented the annual treasurer's report for the Section, which was accepted as read.

As there was no further business brought before the meeting, Mr. Culver introduced William F. Deady, of the Slatersville Finishing Company, who presented a paper on "The Systematic Handling of Dyestuffs in Practice and the Practical Application of the Metric System," which is printed in full herein.

The attendance was about 100.

L. L. BAMBERGER, *Secretary.*

## THE SYSTEMATIC HANDLING OF DYESTUFFS IN PRACTICE AND THE PRACTICAL APPLICATION OF THE METRIC SYSTEM

By WILLIAM F. DEADY, *Slatersville Finishing Company*

Since the war we have all heard more or less about dyestuffs. The halls of Congress and the press have been filled with dyestuff propaganda, all of which brought to public attention the important part that color plays in our everyday life.

The art of dyeing materials into various colors had been practised from time immemorial, and specimens of brightly colored cloths and leathers have been found in Egyptian tombs, with the original tints apparently unchanged, thus showing that the arts were practised and understood at least 3,000 years ago.

The natural desire on the part of the dyer to render his product more attractive and enhance its beauty, led to early experiments in the way of dyeing. The resources which the early dyer had at his command for the purpose, were comparatively few, and his dyes were chiefly obtained from the vegetable kingdom. They were derived from a variety of roots, barks, flowers, etc., and their number was only slowly added to until the middle of the last century, when the development and production of synthetic dyes chiefly from coal tar, revolutionized the whole dyeing industry. The processes of dyeing have been transformed from what depended almost entirely upon rule of thumb methods, with the use of infusions or solutions in uncertain quantities and of unknown strengths, to an exact science involving the accurate use of definite formulae.

Instead of the handful of coloring matters that constituted the early dyer's stock in trade, we have to-day the choice of over 600 different dyestuffs, and no doubt many more will be added to the list by our American chemists. Along with this increase in the number of dyes, came an increase in the demands upon the dyer.

New shades are introduced each season which find favor with the public, and it is up to the dyer to reproduce them on many different materials. Now as many of the shades met with require the combination of two or more dyestuffs for their reproduction, you can readily see that an industry catering to the public demand has to carry a stock of many different dyes. The proper selection of these dyes, and the most efficient methods of handling them, are problems which require much thought and study.

To my mind a cotton finishing plant uses as great a variety of dyes as any other color using institution, and as my experience has been chiefly in this line of work,

I will endeavor to outline a little system which I have found very helpful in the handling of these dyes. With a few minor changes I believe it could be applied to other lines of dyeing.

First, let us dwell on the selecting of a color. A product sample of the color is received from a dyestuff manufacturer. It is tested by various laboratory methods for shade, properties, and money value if compared with another dye of the same type. If the laboratory test proves satisfactory, and it is thought advisable to use the dye in regular work, it is given a symbol (the use of these symbols will be explained later), and a requisition is made out and forwarded to the purchasing department requesting that department to order a small quantity of the dye, say, five pounds.

When the order is received, the dye is given a practical test in the dyehouse, and careful inspection is made during process, and after finishing, to ascertain whether it stood up as well or better than the dye it is to replace. If it did not, conditions may be varied to correct any fault that may have become noticeable during the first test, and a second test is made under the new conditions. If it still fails it is discarded. On the other hand, if it fulfills all expectations it is ordered in larger quantities in the same manner as the sample.

Each barrel or keg of dye ordered is given a number on the order, and when it is received it is sent to the stores department, where the number and symbol are placed upon it. After thus marking the package a small sample is withdrawn and placed in an envelope. The envelope is marked with the barrel number and the dye symbol, and together with a printed stores form in duplicate, is sent to the laboratory. Here the sample is tested and compared with the original sample. If the test proves satisfactory the forms are signed and returned.

The duplicate copy is retained by the stores department and the original forwarded to the purchasing department. This shows the purchasing agent that the dye was satisfactory. Upon the strength of this he recommends payment be made according to the invoice.

The numbering of packages is carried out as follows: Blacks are numbered from 1 to 9, blues from 10 to 19, greens from 20 to 29, yellows from 30 to 39, oranges from 40 to 49, reds from 50 to 59, violets from 60 to 69, browns from 70 to 79, miscellaneous from 80 to 100.

Very seldom more than ten packages of any one color are in stock at the same time, because the dye manufacturers have been able to make very prompt deliveries. If this situation should occur, it could be handled by placing letters after the numbers.

The numbering of packages in this manner served a twofold purpose:

First, it enables the stores department to designate exactly from which package the sample was withdrawn, in case it does not measure up to standard.

Second, it enables the dyehouse to order a definite package out of stores, thus reducing the chance of having the wrong package sent over by mistake.

Now let us take the case of using symbols to designate a certain dye in place of using the trade name. As I previously stated, there are over 600 dyestuffs on the market to-day, each having a different trade name. Also there are nearly 100 different dyestuff manufacturers, and each has a trade name for his products. Of course, they all do not make the entire list of dyes, but in many cases there are several who make practically the same product. Take Direct Fast Red 8BL, for instance. There is Pontamine Fast Red 8BL, made by Du Pont; Chlorantine Fast Red 7BY, by Ciba; Dianol Fast Red K, by Levenstien; Amidine Fast Red 8BL, by Campbell; Benzo Fast Red 8BL, by both Grasselli and Bayer; Diamine Fast Red 8BL, by Cassella, etc. All are practically the same type, but may vary in price and strength. Whichever one is chosen it carries with it a rather long name.

Also there are certain types of dyes that have practically the same trade name except for the suffix at the end, such as Benzo Fast Blue RL; Benzo Fast Blue GL; Benzo Fast Blue 2GL; and Benzo Fast Blue 4GL. These dyes vary in tone, the RL having a reddish cast, and the other three shading on the green, the 4GL being the greenest and brightest. Many other instances may be cited, but to get to the more important part of the scheme I will not mention them.

In order to make the system as simple as possible, letters and figures are substituted for the trade names, the letters being picked arbitrarily. B is used to designate all blacks; R for reds; P for pinks; S for scarlets; Y for yellows; K for oranges; U for blues; N for browns; H for violets; G for greens, etc. B1 would stand for a certain direct black; B2 for another; B3 for still another; UB stands for a certain basic blue; GS for a sulphur green, etc.

In fact, any combination of these symbols may be made, and their use serves a threefold advantage:

First, they are simple and easy to understand by the semi-skilled labor found in the majority of dyehouses, thus reducing to a minimum the possibility of putting the wrong dye into a mixing.

Second, much time and effort is saved in making out formulae.

Thirds, the formula is compact and contains complete information for future reference, which I will show later.

Now we come to the most important part of the whole system, and that is the use of the metric system in weighing out these formulae. The metric system, as you all

know, is the basis of our monetary system. It is also extensively used throughout Europe, with the exception of England, not only in monetary systems but in commercial weights and measures. Also sciences such as chemistry, physics, etc., have universally adopted it as a standard in their work. However, dyers seem to be very slow in trying it. I will assure you that anyone who has ever used it in the dyehouse would not care to return to pounds and ounces again.

So important is this system that the American Chemical Society has appointed a committee to co-operate with the American Metric Association, the World Trade Club, and the English Metric Associations, who are trying to develop plans to have the system internationally adopted. So far they have met with great success in this country, over 300 colleges and some 275 technical firms have assured them of their co-operation.

The main objection to the change in most industries, as I understand it, is the cost of changing over plans, specifications, machinery, etc. As far as the dyehouse is concerned there will be no such cost, as most dyehouses use the ordinary balance scales, and the only extra expense entailed would be in purchasing new metric weights, or at the utmost a new scale. In either case it would be money well spent.

To show the main advantage of the combined use of symbols and the metric system let me illustrate by assuming two dyers, A and B, are dyeing a certain shade of tan on the padder; both use the same dyestuffs. A, however, uses avoirdupois weights and writes out the trade name of each dyestuff in making out his formula, while B uses the metric weights and substitutes symbols for the trade names of the dyes:

A—Chlorantine Fast Black L..... 1 lb. 3 oz.
Diamine Fast Orange EG..... 3 lb. 8 oz.
Benzo Fast Brown G..... 1 lb. 7 oz.

| B— | B1 | K1 | N1 |
|---|---|---|---|
| | 538 | 1,586 | 652 |

These figures represent exactly the same quantity of dye.

After taking what we call a hand patch, both dyers agree that if 15 per cent of the black and 5 per cent of the brown were left out the resultant shade would match the standard.

How does A figure his reduction? First, he has to reduce the whole formula to a common denominator, or ounces in this case. One pound three ounces equals nineteen ounces; three pounds eight ounces equals fifty-six ounces; and one pound seven ounces equals twenty-three ounces. He then finds 85 per cent of these, which is sixteen ounces; 47½ per cent oz. and 19½ per cent oz. respectively. This being necessary because he has to reduce his dye liquor 15 per cent to get rid of the excess black. He now finds 15 per cent of the original orange, or 8½ oz. and 5 per cent of the original brown, or 1 1/5 oz., and adds them to the dye liquor, filling the tub up full again. The tub, by the way, is graduated into tenths and half-tenths, and contains 150 liters of liquor.

B's figuring is comparatively simple: He finds 85 per cent of the total and adds back 15 per cent of orange, 228 grams; and 5 per cent of brown or 32 grams, and makes the tub up to 10/10 again.

The formula ticket is an oblong piece of light cardboard, and is ruled on the back to accommodate five dyes and three extra spaces for salt, oil, etc. The face contains spaces for the customer's symbol, the lot number, the yardage, the shade, the construction, the finish, the processes the goods have been through and those which they are still to go through after leaving the dyehouse. In fact, all the necessary information required by the dyer is contained on the upper part of the face, while the middle is reserved for any special remarks. The bottom contains spaces for the machine number; the meter readings, the amount of cloth run, the amount of dye left, and the pad or machine operator's name. When the job is started the card is stamped with the time and again when job is finished. A separate card is made out for each shade. These cards are kept on file in the dyehouse for future reference.

In making up the formula for the padders the amount of dye for a full tub is placed at the top just under the symbols, but if the lot is a small one and would only require about 4/10 of a tub only 4/10 of the formula is weighed out, and this amount is placed at the bottom of the card as shown. All dye that is actually used is recorded at the bottom of the card in the same manner.

Each day these various dyes are totaled up and subtracted from the drug room ledger cards. Each dye has a special ledger card containing all information regarding that dye, the amount of dye on order, the amount in stores, the amount in the dyehouse drug room each day. From these cards the dyer can keep his inventory quite low, because he can estimate his future requirements fairly accurate.

The ledger cards also serve as a check on the weights billed by the dye manufacturer. If the card shows a balance after the barrel is empty, and after rechecking, the card proves to be correct, we know that we did not receive the amount of dye paid for. Of course, a slight variation may occur at times owing to slight differences in weighing, but as a rule these counteract each other.

The cost department receives a slip on each shade dyed, stating the exact dyes and their amounts used. In the cost department the dyes are priced by the kilo or 1,000 grams instead of by the pound, by simply multiplying the pound price by 2 1/5. Cost figuring in decimals is easier than in fractions, and is more easily done on the calculating machines.

I have illustrated the formula method used in pad dyeing, now let us apply the same principles in jig dyeing or kettle dyeing. This idea will also apply to vat dyeing and machine dyeing.

You have so many yards of cloth to dye, weighing so much per yard, or so many yards per pound, or in the case of yarn or raw stock so many pounds. First convert the weight into grams by multiplying each pound by 453, the number of grams in a pound, then find the percentage of dyestuff required in the usual manner. This formula is placed at the top of the card similar to the pad formula and the amount of dye weighed out, at the bottom. Suppose we have five rolls of the same shade. At the bottom you just put the dye weighed out for each roll; adding this gives you the amount used on the lot.

The above comment has referred chiefly to dyes in the powder form, so now let us consider the printer and the dyer who uses dyes in the paste form, such as vat dyes and some alizarine colors. In this case the cubic centimeter will replace the ounce and the liter will be substituted for the gallon. You can readily see the advantage of this change, because there is a direct decimal relation between cubic centimeters and liters, 1,000 of the former equaling one of the latter. While the relation between ounces and gallons, being 128 to 1, is rather an awkward proportion to figure.

In closing let me bring just one more point to your attention. To-day many large firms are employing a colorist to match shades in the laboratory on a small scale before the larger lots are done in the dyehouse, thus saving much time and sometimes considerable expense. The colorist in the majority of cases uses the metric system in his work, but when he turns his results over to the dyer there is some confusion, and no doubt considerable figuring and approximation before the proportions are made up in a practical way. Now if both departments used the metric system there would be a direct proportion both as to weights and volumes, thus greatly simplifying the work.

## LOWELL TEXTILE SCHOOL JUNIOR BRANCH

In accordance with a vote taken by the Council, a Junior Branch of the American Association of Textile Chemists and Colorists was organized at the Lowell Textile School. This branch, however, is to be affiliated with the Northern New England Section until such a time as a special amendment may be passed by the Association authorizing independent Junior Sections.

At the inaugural meeting the following officers were elected: Everette V. Steele, chairman; Edward B. Bell, vice-chairman; Robert W. Jaeger, Jr., secretary and treasurer.

### Report of the First Meeting of the Lowell Textile School Junior Branch

The first meeting of the Lowell Textile School Junior Branch of the American Association of Textile Chemists and Colorists was held Thursday afternoon, March 22, in the Chemistry Lecture Room.

The meeting was called to order by the chairman, Everette V. Steele, who introduced A. Seymour Mann, of Providence, R. I., who is associated with the Original Bradford Soap Works, Inc., of that city. Mr. Mann spoke upon the subject of "Fulling Oils Versus Soap," which is given below.

After the lecture many questions were asked by those present, which were answered and explained quite fully by Mr. Mann. The upper classmen of the Wool Department were invited guests upon this occasion. Before adjournment the chairman reported that arrangements were being made to have several meetings before the close of the school year and interesting speakers were being secured for these meetings.

ROBERT W. JAEGER, JR., *Secretary and Treasurer.*

## FULLING OILS VS. SOAP

By A. SEYMOUR MANN
*Original Bradford Soap Works, Inc.*
*Providence, R. I.*

*Lecture Delivered Before the Junior Branch of the American Association of Textile Chemists and Colorists at the Lowell Textile School, March 23, 1923*

It is my intention to show and compare the value of the so-called fulling oils on the various fabrics now being manufactured with this valuable product. But before going into the main subject I desire to relate some of the early history of the art of soap making and to describe how this art has slowly advanced to really being an art.

We find as early as the first century the Roman historian Pliny mentions the manufacture of soap, which was taught to the Roman people by the Germanic tribes who invaded Gaul during that time. The materials used were goat's tallow and the ash obtained

from incineration of beech bark. These two ingredients were mixed together and boiled the same as are the fats and alkali of to-day.

In the beginning of the ninth century we find that a Fanti race located on the west coast of Central Africa also made soap from crude palm oil and mixed or boiled it with the ash which they obtained from plantain and banana skins.

To go further into the art, we also find that during the ninth century the art of soap making was practised in Spain and became quite an industry, owing to the excellent field very close to the manufacturer for obtaining olive oil.

In the fourteenth century and fifteenth century we find the industry flourishing in France and later in England; the latter due perhaps to the Spanish and French merchants who were ever on the lookout for an outlet for their products.

If we were to visit the ruins of the ancient city of Pompeii we would be shown by the guides, as one of the first things of interest, an ancient soap maker's shop just as it was in the days of its existence.

It is my desire to outline here a graphic formula of the action which takes place in a boiling kettle of soap in the course of manufacture.

$$\left.\begin{matrix} C_{17}H_{35}COO \\ C_{17}H_{35}COO \\ C_{17}H_{35}COO \end{matrix}\right\} C_3H_5 + 3NaOH = 3C_{17}H_{35}COONa + C_3H_5(OH)_3$$

i. e., glyceryl stearate + caustic soda = sodium stearate soap + glycerine.

The greases that are used in the manufacture of soaps are numerous, but those most used at the present day are house grease, so termed owing to the fact that it is collected from the butcher and sometimes from the abattoirs in the various cities that have such places where animals are slaughtered: Palm oil, sheep stearine, red oil, cottonseed oil, linseed oil, teaseed oil and quite a number of the fatty acids such as corn oil, cocoanut oil, fish oil, etc.

We have covered the history of soap making up to the present time, and I want to call to your attention the manufacture of the fulling, or sometimes called scouring and fulling, oil. This is the main part of my lecture, and I will go into this at length so that you will see the difference in the two products; although they differ in their construction, they do not differ in use, for they are both for the one purpose. It is necessary for me to say that fulling oils in a number of instances cannot take the place of soap, but this matter I will leave for an explanation later.

In 1880 attempts were made to use oils for fulling by putting the animal oils directly into the goods, and then adding the alkali to the pieces in a warm liquid state, but it proved a complete failure. The reasons for the failure perhaps would take a very lengthy or more fully developed explanation, but it can be said that the principal reason was due to the fact that stearic or palmitic acid would deposit in the piece and it would take unlimited time to remove either of these acids, hence the long delay was very costly to the manufacturer.

Now we come to the uses of red oil and lard oil for carding and spinning, and the additions of either borax or some form of alkali which would make an emulsion with water when added to the animal oils. At this particular point I will go more fully into the reasons why and in what instance fulling oils cannot be substituted for soap.

In the manufacture of woolens of any kind where they are made from virgin wools it is not required to oil the stock so much for carding and spinning as it is when the fabrics are made from reworked wools. Then, again, they will felt well if the stock is of good quality with very little fulling, but it is absolutely necessary to get sufficient wool oil into the stock to have it pass through the various stages without trouble even though it be virgin stock. But it is entirely another story with the process of reworked wools, and he average manufacturer of shoddy will get into his stock as much wool oil as he can with safety, to be sure, that it will go through the various stages of manufacture. The latter is one of the principal reasons why fulling oils will work so well in a plant making shoddy woolens or worsteds which require the fulling process to make the fabrics.

Here we may fully explain the reasons, as said before, why fulling oils are particularly adopted for woolens which are well saturated with an ordinary grade of wool oil. To best explain it without lengthy writing would be to say that in materials which have an abundance of wool oil all that is necessary with the use of milling oils is to add a good quantity of soda ash with the milling oil, as in some instances 100 pounds soda ash and 100 pounds of milling oil are used to full with. But if the fabric off the loom is not well greased with the wool stock, then it will require far more milling oil to full the pieces. It is readily seen that under such circumstances it is the animal fats already put into the yarns before weaving them that help to do the work as much as the fulling oils that are used. In the case of woolen worsteds, they are very easily worked with milling oils, because they require only a slight fulling to put sufficient cover on them for market. At this

point of the explanation of the various uses of milling oils it is well to also add that you cannot scour the grease out of a fabric which is to be fulled after scouring with a solution of milling oil unless you use considerable soda ash to the scouring bath; especially is this true of fabrics which do not contain very much wool oil.

For the proper conclusion of the difference between the milling oils and soap it is necessary to know the construction of both, and to go into thorough detail it would require a very long treatise. But, in short, the facts are as follows as regards the construction of the two products: Milling oils are made by the blending in proper proportion of two oils with the assistance of either potash or caustic soda as the saponifiable materials. They are made in some instances under cold process or by slightly warming the red oils, which is most in use for the manufacture of the milling oils now on the market. The construction is very simple, but it is many times hard to blend them properly if those who are making the preparation use a trifle more of one oil than the other. For instance, if the soluble oil used is in a greater quantity than required or the same is true of the alkali used, the product will show signs of becoming transparent or will show a slight excess in fats if too much red oil be used. When it is properly prepared it should show a ribbon-like appearance or streaky, which indicates that the soluble oil and caustic used have just slightly saponified the red oil.

The construction of soap is an entirely different matter and is simply explained by saying that it is fats and alkali boiled together until the process of ebullition takes place, or, to use the soap maker's expression, opening up the stock; but it is a long-drawn-out process as compared with milling oils and, as said before, the whole construction is entirely different. To further show how the construction differs you may take 50 pounds of a good grade of palm oil soap containing 65 per cent of fatty acid and add it to 100 gallons of water; it will require at least one hour to thoroughly dissolve the soap. But should you take the same quantity of milling oil and put in into the same amount of warm water it would be ready for use in less than ten minutes. This is one of the reasons why it is of such value in the averaged woolen mill, because it can be prepared for use almost instantly when wanted. Another feature about it is the fact that when once prepared it does not congeal and require a second boiling when the mill starts up in the morning. The only boiling or dissolving there is to the process is the dissolving of the soda ash or alkali which is used for sharpening the oil a little.

In order that we may more fully understand what fabrics are best processed with milling oils, it may be said here that such fabrics as plaid backs, polos, meltons, tibets, kersey, cotton warp blankers and most any grade of shoddy fabrics, but an excellent finish has been produced on plaid backs with milling oil. The writer has had some success with unfinished worsteds, but little or no success at all with clear-finished fabrics. The latter may be best summed up by saying that such fabrics are made in the loom with a fine grade of clean yarns and require only a very light scouring to finish them, and in the finishing of this latter fabric it is certain thus far that soap can never be substituted by milling oils.

A little may be said about the action of lime soaps on milling oils as compared with soap. The writer has had experience with processing fabrics in mills where hard water was prevalent, and the tests were decidedly in favor of the milling oils. The fact may be due to the amount of soluble oils used in the manufacture of milling oil, but it may be a mistake to make the statement and the retard action may be due principally to the free alkali always found in milling oil.

To bring my lecture to a proper conclusion I simply wish to say that during the writer's experience with milling oils as concerns the use of them in the mills, and also in their manufacturing, I do not believe that they will ever entirely take the place of soap. But I do firmly believe that a product has been found that is invaluable to the woolen or shoddy woolen or woolen worsted manufacturer.

## METHOD OF ANALYSIS OF HYDROSULPHITES AND SULPHOXYLATES ABSTRACT

By Edward L. Helwig
*Rohm & Haas Company*

*An abstract of a paper recently read before the Philadelphia Section of the Association*

The following reagents have been proposed for the titration of hydrosulphites and sulphoxylates. The methods involved have been tested and compared, with the following results:

*Indigo and Indigo Sulphonic Acid Titrations*—Valuable for determining relative strength of samples, but of little use for obtaining absolutely purity figures. Indigo is too difficult to standardize.

*Methylene Blue*—End point not so good unless indirect titration method of Crother and Heywood is used. This method found to be most accurate of all, but is time-consuming and solutions must be frequently restandardized.

*Ammoniacal Copper Sulphate*—Very convenient and

quick. Solution is easily standardized and keeps indefinitely. Method is equally good for hydrosulphites and sulphoxylates, and results are not influenced by impurities usually found in the commercial products. This method is considered best for routine control work.

*Potassium Ferricyanide*—Not applicable to titration of sulphoxylates. This method is least affected by access of air during titration. High results obtained in presence of thiosulphates.

*Ferric Alum*—Can be used for titration of both hydrosulphites and sulphoxylates, but is also influenced by presence of thiosulphates. End point fades rapidly.

*Iodine*—Only applicable to sulphoxylates titration. High results in presence of sulphite or bisulphite.

*Reduction of Ammoniacal Silver Chloride*—Good method for hydrosulphites, but not applicable to sulphoxylates.

*Reduction of Potassium Mercuric Iodide*—Not as good as silver method. Results influenced by thiosulphates. Also not applicable to sulphoxylates. The last two methods are too cumbersome, involving filtration, washing and resolution of precipitate with subsequent titration.

## CHANGES IN ADDRESS

The following changes in addresses of members should be noted:

H. S. Busby, 101 Park Avenue, New York City: Room 518.

John N. Dalton, 900 Hope Street, Providence, R. I.

M. C. Dearing, Southwest Textile Finishing Company, Redlands, Cal.

Fiebiger, Peter, U. S. Appraiser's Stores, 641 Washington Street, Room 1002, New York City.

R. M. Fischer, Farmingdale, L. I., N. Y.

Gainey, Frank W., 1 Kingston Street, Lawrence, Mass.

Goldthwait, Charles F., Thirty-sixth and Benson Streets, Baltimore, Md.

Hennessey, J. H., 90 Stanwood Street, Providence, R. I.

Harold J. Higginbottom, care of American Coat Pad Company, Inc., 1007 East Pratt Street, Baltimore, Md.

Lawton, H. F., 199 North Main Street, Fall River, Mass.

Lawton, H. F., 11 Central Street, Newport, R. I.

Lyons, Robert K., 159 Lloyd Avenue, Providence, R. I.

Perlman, S. Donald, P. O. Box 378, Passaic, N. J.

Poetzsch, Otto T., 158 Gregory Avenue, Passaic, N. J.

Schwarz, H. L., 26 North Terrace Avenue, Mount Vernon, N. Y.

R. R. Sleeper, The Calco Chemical Company, Bound Brook, N. J.

Watson, John C., 278 Prospect Street, Pawtucket, R. I.

### Change, Junior Membership

Butler, William H., 115 Mount Vernon Street, Lowell, Mass.

## MAY MEETING OF NEW YORK SECTION

At the meeting of the New York Section to be held Friday, May 25, Stewart F. Carter, of Jacques Wolf & Co., Passaic, N. J., will speak on "The Old Mandarin (or Nitric Acid) Style in Silk and Some Other Matters of Interest in Textile Printing."

This will be the final meeting of the spring season and is also the annual meeting of the Section, at which new officers for the coming year will be elected. All members are requested to make a special effort to be present.

L. C. Lewis, *Secretary.*

AMERICAN
DYESTUFF REPORTER

Devoted to the use and application of dyestuffs and the mechanical equipment incidental thereto.

LOUIS A. OLNEY
PROFESSOR OF CHEMISTRY AND DYEING, LOWELL TEXTILE SCHOOL
*Directing Editor*

LAURANCE T. CLARK
*Managing Editor*

Published biweekly by
HOWES PUBLISHING CO., INC.
4109 Woolworth Building, New York City

A. P. HOWES, *President* E. S. PREDMORE, *Secretary*

Subscription price $5.00 per year; Canadian $5.50; foreign $6.00

Vol. XII April 23, 1923 No. 9

## STOP PEDDLING EXCUSES

SELDOM has an educational exhibit of more power, or carrying with it more genuine conviction, been offered for the consideration of dye consumers and the general public than was that of the Du Pont company at the Knitting Arts Show in Philadelphia.

Briefly, the display consisted of a number of panels arranged to form a poly-sided structure, pyramidal in shape and flattened off midway to the top. On these panels were displayed samples of hosiery—cotton, wool, and silk—dyed in a variety of both fast and fugitive colors.

The purpose of the display was brought out by means of two samples of the same material dyed respectively, for instance, with a fast and a fugitive black. Both appeared identical. Following, however, were sample sets of hose from the same dyeings after having been washed in a commercial laundry five and ten times respectively. In the case of the fast color the hose had retained the original black, while the fugitive color had grayed noticeably after five washings and conspicuously after ten. Tags on each sample told the story to the spectator, and there were also certificates from the laundry to the effect that the hose had been subjected to the regular procedure, neither more nor less than that accorded all similar work.

Samples figuring in these tests were shown in a wide variety of up-to-date colors. The panels were made detachable so that they could be carried over to a special daylight lamp for inspection. All colors used in the tests are available in the American market, and, best of all, dyeing formulas accompanied each set of samples.

The whole constituted a clean-cut demonstration which, if it could be placed in leading department store windows throughout the country for a few months, or otherwise brought to the attention of the public, would speedily convince American women and their brothers that times without number they have bought merely an excuse with money which could just as readily have purchased real results.

To cover these United States with such a demonstration would probably not be practicable, but at the Knitting Arts Show it must have come under the notice of many hosiery men, and it is to be hoped that the lesson had some effect. It was not to be expected that the display could teach them much they didn't already know, but perhaps the effect might be strong enough, morally, to influence future action to some extent.

The choice of hosiery by the Du Pont company as a medium for its demonstration was, it seems to us, a particularly happy one. When the war stopped the importing of German products, the hosiery people were among the loudest in telling the country of its misfortune in not having a self-contained dye industry. They called vociferously upon all to witness the undoubted fact that without fast colors they, personally, could not give the public its fast-colored hosiery.

At length American manufacturers began to produce Sulphur Black and, later, other excellent cotton colors. But the hosiery people refused to be comforted, declaring that their problem would not be solved until the finer wares, the good, fast vat colors, were available. Encouraged by these evidences of a ready—not to say eager and panting—market, the Newport Chemical Works came through handsomely and produced for the trade the tried-and-true Zambesi Black, under the name of Newport Fast Black V.

Here was the beginning of exactly what the hosiery people had been telling the public was necessary to the complete hosiery happiness of both. They had been worrying along with Direct Black, and now came the opportunity to stop making the excuse that American manufacturers had not yet produced anything like a German dye.

We digress here long enough to retell the story, current before the days of the Irish Republic, of the two Irishmen who bore the somewhat unfamiliar names of Pat and Mike.

"Mike," said Pat one fine morning as the pair were on their way to work, "I hear-rd lasht noight thot England had given in and granted freedom to Oirland."

"Ye don't mane it!" exclaimed Mike. "Och whurra, an' isn't it just loike England t' think av a dhirty thrick loike thot!"

Now, there was no sound reason why the hosiery people should have regarded the production of American Zambesi in the light of a dirty trick on the part of Newport, and there is no direct evidence to show that they did so regard it.

But Zambesi Black, or Newport Fast Black V, at that time cost them from eight to ten fold what the products they had been using cost.

(*Continued on page* 334.)

## MARCH DYE IMPORTS

(*Continued from page* 312.)

non-competitive dyes is based on the United States value, as defined in subdivision (d) of Section 402 of Title IV of the Tariff Act of 1922. This information was not available in all cases at the time of transcribing, but it is hoped that in the future monthly reports this can be made more complete.

The data for several invoices covering imports during March were not available during the month for transcribing the necessary information. These figures will be included in the April monthly report.

(*Denotes classification as non-competitive; †denotes classification as competitive.)

| Schultz No. | Name of Dye, Classification, Manufacturer, and Per Cent by Countries | Quantity (pounds) |
|---|---|---|
| 14. | Diphenyl Chrysoine: | |
| | *Diphenyl Chrysoine GC—(G); Sd. 100 | 661 |
| 19. | Fast Light Yellow; Gy. 100 | 80 |
| | †Fast Light Yellow 2G—(By) | |
| | †Fast Light Yellow 3G—(WD) | |
| 28. | Hansa Yellow G; Gy. 100 | 2,240 |
| | Hansa Yellow G Paste—(M) | |
| 34. | Chrysoidine R; Gy. 100 | 5 |
| | Chrysoidine RL Base—(By) | |
| 56. | Autol Red | 55 |
| | *Nitrosamine Red Paste—(B); Gy. 100 | |
| 100. | Eosamine B | 3,501 |
| | *Eosamine B—(A); Gy. 100 | |
| 117. | Erika; Gy. 100 | 50 |
| | Erika 2GN—(A) | |
| 118. | Geranine; Gy. 100 | 154 |
| | *Geranine G—(By) | |
| 119. | Diamine Rose; Gy. 100 | 100 |
| | †Diamine Rose GD—(C) | |
| 154. | Palatine Chrome Brown; Gy. 100 | 1 |
| | †Pilatus Chrome Brown W—(B) | |
| 220. | Palatine Black; Gy. 100 | 4,000 |
| | *Wool Black GRF—(A) | |
| | †Wool Black 6B—(A) | |
| | Wool Jet Black 3B—(A) | |
| | Wool Jet Black 3B, old comb.—(A) | |
| 221. | Anthracene Acid Brown; Gy. 100 | 353 |
| | †Anthracene Acid Brown G—(C) | |
| 222. | Janus Yellow; Gy. 100 | 110 |
| | *Janus Yellow G | |
| 273. | Diaminogene Blue; Iy. 100 | 211 |
| | *Diaminogene Blue NA—(C) | |
| 274. | Diaminogene; Gy. 100 | 5,660 |
| | Diazo Indigo Blue 2RL—(By) | |
| | *Black Extra (Diaminogene Ex.)—(C) | |
| 276. | Diamond Green; Gy. 100 | 100 |
| | †Diamond Green B—(By) | |
| 294. | Fast Mordant Yellow; Gy. 100 | 11 |
| | †Fast Mordant Yellow G Pdr—(B) | |
| 306. | Pyramine Orange 3G; Gy. 100 | 1,000 |
| | *Ingamine Orange 3G—(B) | |
| 326. | Oxydiamine Violet; Gy. 100 | 250 |
| | Naphthamine Violet BE—(K) | |
| 332. | Benzo Fast Red; Hd. 58 | 522 |
| | †Benzo Fast Red 8BL—(By); Iy. 42 | |
| 338. | Naphthamine Blue; Gy. 100 | 1,981 |
| | *Naphthamine Blue JEF—(K) | |
| 358. | Diphenyl Red; Iy. 76 | 2,326 |
| | Aceto Purpurine 8B—(A) | |
| | *Chloramine Red 8BS—(By) | |
| | *Chloramine Red 8BS Conc.—(By) | |
| 360. | Pyramine Orange R; Gy. 100 | 500 |
| | *Ingamine Orange R—(B) | |
| 373. | Congo Orange; Gy. 100 | 200 |
| | *Congo Orange R—(A) | |
| 456. | Benzo Fast Blue; Gy. 100 | 1,329 |
| | *Benzo Fast Blue 4GL—(By) | |
| 494. | Auramine G; Sd. 100 | 220 |
| | *Auramine G—(G) | |
| 503. | Neptune Green; Gy. 100 | 100 |
| | †Night Green A Ex. Conc.—(tM) | |
| 505. | Light Green (yellowish); Gy. 100 | 150 |
| | †Light Green SF Yellowish XX—(B) | |
| 506. | Erioglaucine; Sd. 100 | 7,500 |
| | *Erioglaucine AP—(G) | |
| 515. | Methyl Violet; Ca. 100 | 95 |
| | †Methyl Violet Base—(B) | |
| 516. | Crystal Violet; Gy. 100 | 275 |
| | †Crystal Violet Crystals—(tM) | |
| | †Crystal Violet Extra—(B) | |
| | †Violet in Crystals Ex. Conc.—(K) | |
| 518. | Ethyl Purplue; Gy. 100 | 1,000 |
| | *Ethyl Violet—(B) | |
| 523. | Fast Green; Gy. 89, Hd. 11 | 6,724 |
| | *Fast Green Ex. Bluish—(By) | |
| | *Fast Green Ex. Bluish Conc.—(By) | |
| 527. | Acid Violet 4BN; Gy. 100 | 330 |
| | †Acid Violet 7BN—(By) | |
| 528. | Fast Acid Violet 10B; Sd. 100 | 3,205 |
| | †Kiton Fast Violet 10B Conc.—(I) | |
| 531. | Erio Cyanine; Sd. 100 | 110 |
| | †Erio Cyanine AC—(G) | |
| 534. | Acid Violet 7B; Sd. 93, Gy. 7 | 400 |
| | †Acid Violet 7B Conc.—(B) | |
| | *Chrome Azurol S Conc.—(G) | |
| 536. | Alkali Blue; Gy. 7 | 100 |
| | †Alkali Blue 3R Conc.—(tM) | |
| 537. | Methyl Blue for Silk; Sd. 98, Gy. 2 | 5,067 |
| | †Methyl Lyons Blue—(G) | |
| | *Methyl Silk Blue New—(G) | |
| | †Pure Blue 2G—(tM) | |
| 539. | Soluble Blue; Gy. 100 | 225 |
| | Cotton Blue Conc. No. 2—(M) | |
| | †Water Blue (32129)—(A) | |
| 543. | Patent Blue; Gy. 100 | 10,050 |
| | *Patent Blue V—(M) | |
| | Patent Marine Blue LE 60%—(M) | |

| Schultz No. | Name of Dye, Classification, Manufacturer, and Per Cent by Countries | Quantity (pounds) |
|---|---|---|
| | †Poseidon Blue BGX Conc. (Neptune Blue BGX Conc.)—(B) | |
| 545. | Patent Blue A; Gy. 91, Ca. 9 | 550 |
| | †Patent Blue A—(M) | |
| 546. | Cyanol; Iy. 98, Gy. 2 | 2,700 |
| | *Cyanol FF—(Q) | |
| | Cyanol Extra—(C) | |
| 559. | Victoria Blue B; Gy. 100 | 10 |
| | †Victoria Blue B Highly Conc.—(B) | |
| 560. | Night Blue; Gy. 100 | 5 |
| | *Night Blue—(B) | |
| 562. | Fast Acid Blue; Gy. 100 | 99 |
| | *Brilliant Wool Blue FFR Ex.—(By) | |
| 571. | Rhodamine 6G; Gy. 45, Iy. 45, Ca. 10 | 1,191 |
| | *Rhodamine 6GDN Ex.—(B) | |
| | Rhodamine 6GD Ex.—(M) | |
| | Rosazenie 6GD Ex.—(M) | |
| | *Rhodamine 6G Ex.—(Q) | |
| 572. | Rhodamine G; Sd. 53, Iy. 47 | 412 |
| | Rhodamine G Ex.—(B) | |
| | *Rhodamine RRR—(G) | |
| 573. | Rhodamine B; Sd. 60, Iy. 37, Ca. 3 | 3,670 |
| | †Rhodamine B Ex.—(I); | |
| | †Rhodamine B Ex.—(Q); | |
| 597. | Rose Bengale B; Gy. 100 | 26 |
| | †Rose Bengale B—(B) | |
| 606. | Phosphine; Gy. 96, Iy. 4 | 5,427 |
| | *Coriophosphine OX Ex.—(By); | |
| | Phosphine G—(By) | |
| | *Phosphine 3R—(A) | |
| 608. | Patent Phosphine; Gy. 100 | 1,300 |
| | *Patent Phosphine RRDX (Euchrysine RRDX)—(B) | |
| | Patent Phosphine GRNTN—(By) | |
| 613. | Quinoline Yellow; Gy. 100 | 1,000 |
| | †Quinoline Yellow RT Ex. Conc.—(By) | |
| 618. | Thioflavine T; Iy. 53, Ed. 47 | 1,222 |
| | Thioflavine T—(C); | |
| 624. | Violet Modern N; Sd. 100 | 220 |
| | *Modern Violet N Pdr.—(DH) | |
| 627. | Anthracyanine; Sd. 100 | 440 |
| | *Anthracyanine S Pdr.—(DH) | |
| 653. | Nile Blue; Gy. 100 | 1,000 |
| | *Danubia Blue BX—(B) | |
| 661. | Thionine Blue; Gy. 100 | 600 |
| | Thionine Blue GO—(M) | |
| 672. | Azo Carmine; Gy. 100 | 700 |
| | *Azo Carmine GX—(B) | |
| 673. | Azo Carmine B; Gy. 90, Iy. 10 | 1,213 |
| | *Azo Carmine—(B); | |
| | *Azo Carmine BXH—(B) | |
| | Rosinduline 2B Bluish—(K) | |
| 699. | Induline (soluble in water); Gy. 100 | 100 |
| | †Induline NN—(B) | |
| 700. | Nigrosine; Gy. 100 | 393 |
| | †Nigrosine T—(B) | |
| | *Silver Gray P—(A) | |
| 705. | Indamine 6R; Gy. 100 | 2,000 |
| | *Acid Cyanine BF—(A) | |
| | *Indocyanine B—(A) | |
| 735. | Pyrogene Indigo; Sd. 100 | 220 |
| | †Pyrogene Indigo Conc.—(I) | |
| 746. | Katigene Green; Sd. 100 | 4,233 |
| | †Pyrogene Green 3G Conc.—(I) | |
| 754. | Kyrogene Violet; Gy. 100 | 100 |
| | Kurgan Violet 3RX—(By) | |
| 759. | Anthraflavone G; Gy. 64, Iy. 36 | 3,312 |
| | *Anthraflavone GC Pst.—(B); | |
| | Anthraflavone GC Pdr.—(B) | |
| | *Anthra Yellow GC Pst.—(B) | |
| 760. | Indanthrene Golden Orange G (single strength) Iy. 60, Fe. 40 | 2,116 |
| | *Indan. Golden Orange G Pst.—(B); | |
| | *Indan. Golden Orange G Dbl. Pst.—(B) | |
| | *Indanthrene Golden Orange G Dbl. Pst. Fine—(B) | |
| | *Indan. Golden Orange G Pdr.—(B) | |
| 761. | Indan. Golden Orange (single strength); Iy. 64, Gy. 36 | 15,181 |
| | *Indan. Golden Orange RRT Pst.—(B); | |
| | Indan. Golden Orange RRT Pst. Fine —(B) | |
| | Indan. Golden Orange RRT Pdr.—(B) | |
| | *Indan. Gldn. Orange RRTS Pdr.—(B) | |
| 763. | Indan. Dark Blue BO (single strength); Iy. 100; | 556 |
| | †Indan. Dark Blue BO Pdr.—(B) | |
| 767. | Indan. Violet RR (single strength); Gy. 100 | 850 |
| | †Helindone Violet DIRR Ex. Pst.—(M) | |
| | †Indan. Violet RR Ex. Pdr.—(B) | |
| 778. | Alizarine VI; Gy. 100 | 8,380 |
| | †Alizarine VI Ex. Pure 20%—(B) | |
| 780. | Alizarine Red; Gy. 100 | 220 |
| | *Alizarine Red S Pdr.—(B) | |
| 804. | Alizarine Blue S; Gy. 100 | 2,102 |
| | *Alizarine Blue S Pdr—(By) | |
| | *Alizarine Blue SB Pdr.—(M) | |
| 807. | Alizarine Black S; Gy. 100 | 546 |
| | *Alizarine Black S Pst.—(M) | |
| 808. | Alizarine Green S Pst.; Gy. 100 | 476 |
| | *Alizarine Green S Pst.—(B) | |
| 810. | Helindone Yellow 3GN (single strength); Gy. 100 | 3 |
| | *Vat Yellow RK Pst.—(B) | |
| | *Vat Yellow RW Pdr.—(B) | |
| 819. | Algol Red R, FF (single strength); Gy. 100 | 3,200 |
| | *Vat Red FF Ex. Pdr.—(By) | |
| 820. | Algol Brilliant Violet R (single strength); Ed. 100 | 472 |
| | *Algol Brilliant Violet R Pdr.—(By) | |

| Schultz No. | Name of Dye, Classification, Manufacturer, and Per Cent by Countries | Quantity (pounds) |
|---|---|---|
| 827. | Indan. Claret B Ex. (sin. strength); Gy. 79, Iy. 21 | 2,550 |
| | *Indan. Bordeaux B Ex. Pst—(B) | |
| | *Anthra Bordeaux R Pst.—(B) | |
| | *Anthra Claret R Pst. Fine—(B) | |
| 831. | Indan. Red BN (sin. strength); Gy. 80, Iy. 20 | 2,553 |
| | *Indan. Red BN Ex. Pst.—(B) | |
| | *Vat Red RK Pst. Fine—(B) | |
| 835. | Algol Olive R (sin. strength); Ed. 100 | 160 |
| | *Algol Olive R Pdr.—(By) | |
| 838. | Indan. Blue RS (sin. strength); Gy. 100 | 22,275 |
| | †Indan. Blue RS Pdr.—(B) | |
| | †Indan. Blue RSP Dbl. Pst.—(B) | |
| | †Indan. Blue RSP Triple Pdr.—(B) | |
| | Vat Blue RSP Triple Pdr.—(B) | |
| 840. | Indanthrene Blue 3G; Gy. 83, Fe. 17 | 1,198 |
| | Indan. Blue 3G Pst.—(B) | |
| | Vat Blue 3G Pst.—(B) | |
| 842. | Indan Blue GCD (sin. strength); Iy. 74, Gy. 20, Ca. 6 | 7,741 |
| | †Indan. Blue GCD Dbl. Pst.—(B) | |
| | †Indan. Blue GCD Dbl. Pst. Fine—(B) | |
| | †Indan. Blue GCD Pdr.—(B) | |
| 848. | Indan. Gray BP (sin. strength); Gy. 100 | 50 |
| | *Anthra Gray B Dbl. Pst.—(B) | |
| 849. | Indan. Yellow (sin. strength); Gy. 88, Iy. 7, Ca. 5 | 18,152 |
| | †Indan. Yellow G Dbl. Pst. | |
| | †Indan. Yellow G. Pdr.—(B) | |
| | *Vat Yellow GP Pdr.—(B) | |
| 850. | Indan. Blue WB; Gy. 100 | 500 |
| | Vat Blue WB Pdr.—(By) | |
| 851. | Alizarine Direct Blue B; Ed. 100 | 80 |
| | †Alizarine Direct Blue B—(M) | |
| 852. | Alizarine Irisol DR; Iy. 100 | 105 |
| | Alizarine Irisol R—(By) | |
| 854. | Alizarine Viridine FF; Gy. 100 | 5,796 |
| | *Alizarine Viridine FF Pst.—(By) | |
| 855. | Alizarine Pure Blue; Iy. 69, Gy. 21, Ca. 10 | 498 |
| | *Alizarine Sky Blue B—(By) | |
| | *Alizarine Sky Blue Pdr.—(By) | |
| 856. | Alizarine Astrol; Gy. 77, Iy. 20, Ca. 3 | 1,642 |
| | *Alizarine Astrol B Pdr.—(By) | |
| | *Alizarine Blue AS Pdr.—(By) | |
| | *Alizarine Rubinol R Pdr.—(By) | |
| | *Alizarine Rubinol 5G Pdr.—(Q) | |
| | Alizarine Rubinol GW—(By) | |
| 858. | Alizarine Saphirol B; Gy. 80, Fe. 19, Iy. 1. | 1,123 |
| | †Alizarine Saphirol SE Pdr.—(By) | |
| | Alizarine Saphirol WS—(By) | |
| | †Alizarine Saphirol WSA Pdr.—(By) | |
| 860. | Cyananthrol G; Iy. 80, Gy. 20 | 275 |
| | *Cyananthrol BGA—(B) | |
| 862. | Alizarine Blue Black; Gy. 100 | 10,483 |
| | †Alizarine Blue Black B—(By) | |
| | †Alizarine Blue Black B Pdr.—(M) | |
| | †Alizarine Blue Black B Pdr.—(By) | |
| | †Alizarine Blue Black 3B Pdr.—(M) | |
| 864. | Anthraquinone Green GXNO; Iy. 100 | 280 |
| | Anthraquinone Green GVNO—(B) | |
| 865. | Alizarine Direct Green G; Gy. 23 | 1,273 |
| | †Alizarine Cyanine Green G Ex.—(By) | |
| | Alizarine Cyanine Green G Ex. Pdr.—(By) | |
| | *Alizarine Cyanine Green 3G Pdr.—(By) | |
| 867. | Indan. Brown (sin. strength); Gy. 100 | 10,000 |
| | †Anthra Brown B Dbl. Pst.—(B) | |
| 869. | Algol Brown B (sin. strength); Iy. 100 | 963 |
| | *Algol Brown R Pst.—(By) | |
| | *Algol Brown R Pdr.—(By) | |
| 873. | Helindone Brown; Gy. 100 | 4 |
| | *Vat Brown GR Pst.—(B) | |
| | *Vat Brown GR Pdr.—(B) | |
| | *Vat Red Brown R Pst.—(B) | |
| | *Vat Red Brown R Pdr.—(B) | |
| 880. | Helindone Blue BB; Gy. 100 | 110 |
| | †Helindone Blue BB Pst.—(M) | |
| 883. | Indigo KG (sin. strength); Gy. 100 | 500 |
| | †Indigo MLB/6B Pdr.—(M) | |
| 885. | Brilliant Indigo; Gy. 100 | 1,287 |
| | Brilliant Indigo B Pst.—(By) | |
| | *Brilliant Indigo B Pst.—(B) | |
| 886. | Brilliant Indigo GD; Gy. 100 | 1,200 |
| | *Brilliant Indigo G Pst.—(B) | |
| 887. | Brilliant Indigo 4G; Gy. 100 | 525 |
| | *Brilliant Indigo 4G Pst.—(B) | |
| 890. | Ciba Yellow G; Sd. 100 | 1,323 |
| | *Ciba Yellow G Pst. 10%—(I) | |
| 895. | Alizarine Indigo 3R; Gy. 100 | 500 |
| | *Alizarine Indigo 3R Pst.—(By) | |
| 901. | Ciba Violet B (sin. strength); Sd. 100 | 15,634 |
| | Ciba Violet B Pst. 10%—(I) | |
| | *Ciba Violet B Pdr.—(I) | |
| 904. | Helindone Brown G; Iy. 100 | 441 |
| | *Helindone Brown G Pst.—(M) | |
| 907. | Ciba Scarlet; Sd. 91, Ca. 9 | 4,027 |
| | *Ciba Scarlet 20%—(I) | |
| | *Ciba Scarlet G Ex. Pst.—(I) | |
| | *Ciba Scarlet G Ex. Pst. 20%—(I) | |
| 913. | Helindone Orange R; Iy. 100 | 68 |
| | *Helindone Orange R Pst. 10%—(K) | |
| 915. | Helindone Fast Scarlet R; Gy. 100 | 416 |
| | *Helindone Fast Scarlet R Pst.—(M) | |
| 918. | Helindone Red 3B (sin. strength); Iy. 100 | 2,736 |
| | Helindone Red 3B Pdr.—(M) | |
| | *Vat Red Violet RH Pst.—(B) | |
| | *Vat Red Violet RH Pdr.—(B) | |
| 919. | Ciba Bordeaux B; Sd. 100 | 771 |
| | *Ciba Bordeaux B Pst. 10%—(I) | |
| 921. | Helindone Gray BM (sin. strength); Gy. 100 | 4 |
| | *Vat Gray 6B Pst.—(B) | |
| | *Vat Gray 6B Pdr.—(B) | |

| Schultz No. | Name of Dye, Classification, Manufacturer, and Per Cent by Countries | Quantity (pounds) |
|---|---|---|
| 923. | Ursol; Gy. 10 | 1,110 |
| | *Fur Dye DF—(A) | |
| | —†Fur Dye P—(A) | |
| | *Fur Dye SA—(A) | |
| | *Fur Dye SC—(A) | |
| | *Fur Dye 4R—(A) | |
| | *Fur Gray ALA—(A) | |
| | *Fur Gray B—(A) | |
| | *Fur Gray R—(A) | |

### Unidentified Acid Dyes

| Name of Dye, Classification, Manufacturer, and Per Cent by Countries | Quantity (pounds) |
|---|---|
| *Acid Milling Black—(G); Sd. 100 | 110 |
| *Acid Pure Blue R—(G); Sd. 100 | 497 |
| Alizarine Emeraldole Green G—(Q); Ed. 100. | 10 |
| †Anthra Cyanine Brown GL—(By); Gy. 100 | 50 |
| *Brilliant Naphthol Blue R—(C); Gy. 100 | 220 |
| *Erio Fast Cyanine SE—(G); Sd. 100 | 331 |
| *Fast Acid Marine Blue HBBX—(B); Gy. 100. | 300 |
| †Fast Light Yellow R—(WD); Gy. 100 | 55 |
| *Guinea Fast Red 2R—(A); Gy. 100 | 100 |
| *Kiton Fast Red 4BL Conc.—(I); Sd. 100 | 1,545 |
| *Minaxo Acid Brown G (Oxamine Acid Brown G)—(B); Gy. 100 | 100 |
| Orin 3B (Anthosine 3B)—(By); Gy. 100 | 100 |
| *Polar Orange R Conc.—(G); Sd. 100 | 1,499 |
| †Silk Blue BIO—(A); Gy. 100 | 500 |
| *Special Blue G—(B); Gy. 100 | 25 |
| *Supramine Black BR—(By); Gy. 100 | 150 |
| *Supramine Brown R—(By); Gy. 100 | 50 |
| *Supramine Red B; Gy. 100 | 200 |
| *Supramine Red B—(By) | |
| Spruce Red B—(By) | |
| *Supramine Yellow R—(By); Gy. 100 | 200 |
| Wool Fast Blue; Gy. 100 | 400 |
| *Wool Fast Blue BL—(By) | |
| *Wool Fast Blue GL—(By) | |

### Unidentified Vat Dyes

| Name of Dye, Classification, Manufacturer, and Per Cent by Countries | Quantity (pounds) |
|---|---|
| Algol Brillian Pink (Hydron Pink); Gy. 68, Iy. 32 | 1,206 |
| *Algol Brilliant Pink FB Pst.—(By) | |
| *Algol Brilliant Pink FF Pst.—(By) | |
| *Hydron Pink FF Pst.—(C) | |
| *Algol Brilliant Red B Pdr.—(By); Gy. 100 | 117 |
| *Algol Brown G Pst.—(By); Iy. 100 | 1,323 |
| Alizarine Indigo Brown R Pst.—(By); Gy. 100 | 10 |
| Anthra Pink R Ex. Pst.—(By); Gy. 100 | 3,000 |
| Ciba Pink; Sd. 100 | 771 |
| Ciba Pink B Pst. 20%—(I) | |
| Ciba Pink BG Pst. 20%—(I) | |
| †Helindone Dark Blue IBOA—(M); Iy. 100 | 220 |
| Helindone Fast Scarlet G Pst.—(M); Gy. 100. | 500 |
| *Helindone Golden Orange IRRT Pst.—(M); Gy. 100 | 1,000 |
| Helindone Pink; Gy. 97, Iy. 3 | 16,208 |
| *Helindone Pink B Ex. Pst.—(M) | |
| *Helindone Pink R—(M) | |
| *Helindone Pink R Ex. Pst.—(M) | |
| *Helindone Pink RN Ex. Pst.—(M) | |
| Helindone Yellow (single strength); Gy. 100 | 250 |
| *Helindone Yellow DAGC Pst.—(M) | |
| †Helindone Yellow DIG—(M) | |
| Helindone Yellow IG Dbl. Pst.—(M) | |
| Hydron Brown CG Pdr.—(C); Fe. 100 | 110 |
| Hydron Brown G Pst.—(C); Gy. 100 | 50 |
| Hydron Brown OG Pdr.—(C); Fe. 100 | 173 |
| *Hydron Scarlet BB Pst.—(C); Fe. 100 | 220 |
| Indanthrene Blue (sin. strength); Iy. 100 | 770 |
| Indanthrene Blue RC Pdr.—(B) | |
| Thio Indigo Rose RN Ex. Pst.—(K); Gy. 100. | 1,000 |
| Thio Indigo Violet (sin. strength); Iy. 100 | 120 |
| *Thio Indigo Violet 2R Pdr.—(K) | |
| Vat Red Violet; Gy. 100 | 3,572 |
| *Vat Red Violet BRK Pst. Fine—(B) | |
| Vat Red Violet RRK Pst—(By) | |
| Vat Red Violet RRK Pst. Fine—(By) | |
| Vat Yellow (powder); Gy. 100 | 6 |
| *Vat Yellow 3RT Conc. Pdr.—(B) | |
| *Vat Yellow 3RT Pdr.—(B) | |

### Unidentified Mordant and Chrome Dyes

| Name of Dye, Classification, Manufacturer, and Per Cent by Countries | Quantity (pounds) |
|---|---|
| *Acid Alizarine Gray G—(M); Gy. 90, Ca. 10 | 550 |
| Acid Chrome Black—(By); Gy. 100 | 100 |
| †Alizarine Light Blue B Conc.—(S); Sd. 100 | 882 |
| Chrome Printing Red B Pdr.—(DH); Sd. 100. | 110 |
| *Chromorhodine 6GN Ex. Pdr.—(DH); Sd. 100 | 220 |
| *Erio Chrome Flavine A Conc.—(G); Sd. 100 | 772 |
| *Erio Chrome Red G—(G); Sd. 100 | 1,103 |
| *Metachrome Blue Black 2BX—(A); Gy. 100 | 1,500 |
| *Metachrome Olive 2G—(A); Gy. 100 | 500 |
| *Metachrome Olive Brown G—(A); Gy. 83, Ed. 17 | 3,000 |
| Omega Chrome Brown; Sd. 100 | 485 |
| *Omega Chrome Brown—(S) | |
| *Omega Chrome Brown PB Conc.—(S) | |

### Unidentified Direct Dyes

| Name of Dye, Classification, Manufacturer, and Per Cent by Countries | Quantity (pounds) |
|---|---|
| *Benzo Chrome Black Blue B—(By); Gy. 100 | 110 |
| *Benzo Chrome Brown 5G—(Q); Ed. 100 | 155 |
| †Benzo Fast Black L—(By); Gy. 100 | 500 |
| *Benzo Fast Brown RI—(By); Gy. 100 | 441 |
| *Benzo Fast Heliotrope BL—(By); Gy. 100 | 550 |
| *Brilliant Benzo Green B—(By); Gy. 100 | 11 |
| Brilliant Sky Blue; Gy. 88, Iy. 12 | 2,619 |
| *Brilliant Sky Blue 2RN—(By) | |
| *Brilliant Sky Blue 8G Ex.—(By) | |

| Name of Dye, Classification, Manufacturer, and Per Cent by Countries | Quantity (pounds) |
|---|---|
| Chlorantine Fast Brown; Ca. 100 | 2,159 |
| *Chlorantine Fast Brown SGL Conc. 112½% —(I) | |
| *Chromanil Black BF—(A); Gy. 100 | 500 |
| Cotton Brown RN—(By); Gy. 100 | 1 |
| *Developing Blue B—(A); Gy. 100 | 600 |
| †Diamine Fast Blue FFB—(C); Iy. 100 | 440 |
| Diamine Fast Bordeaux; Iy. 86, Gy. 14 | 771 |
| *Diamine Fast Bordeaux—(C) | |
| *Diamine Fast Bordeaux 6BS—(C) | |
| Diamine Fast Orange; Ed. 63, Iy. 37 | 890 |
| *Diamine Fast Orange EG—(C) | |
| *Diamine Fast Orange ER—(C) | |
| Diaminiogen Sky Blue 3B—(C); Hd. 100 | 1,320 |
| Dianil Fast Scarlet GS—(Q); Ca. 100 | 25 |
| *Diazo Brilliant Green 3G—(By); Gy. 100 | 50 |
| *Diazo Fast Yellow G—(By); Gy. 100 | 100 |
| *Diazo Geranine B Ex.—(By); Gy. 70, Iy. 30 | 737 |
| *Diazo Olive G—(By); Gy. 100 | 50 |
| †Diazo Phenyl Black V—(G); Sd. 100 | 999 |
| Diazo Pure Blue 3GL—(By); Iy. 100 | 121 |
| *Diazo Sky Blue B—(By); Gy. 100 | 441 |
| *Diazo Yellow R—(By); Gy. 100 | 100 |
| Naphthamine Fast Black KS—(Q); Gy. 100 | 250 |
| Naphthamine Green; Gy. 100 | 500 |
| Naphthamine Green AG Ex.—(K) | |
| Naphthamine Green AN—(K) | |
| Naphthamine Light Blue 4B—(K); Gy. 100 | 100 |
| Naphthamine Light Green G—(K); Gy. 100 | 1,000 |
| Rosanthrene Orange R Conc.—(I); Ed. 100 | 881 |
| Zambesi Black; Gy. 100 | 3,700 |
| †Zambesi Black D—(A) | |
| †Diazanil Black V—(M) | |
| †Zambesi Black V—(A) | |

### Unidentified Sulphur Dyes

| Name of Dye, Classification, Manufacturer, and Per Cent by Countries | Quantity (pounds) |
|---|---|
| †Sulphur Brilliant Blue CLB—(A); Gy. 100 | 100 |

### Unidentified Spirit Soluble and Color Lake Dyes

| Name of Dye, Classification, Manufacturer, and Per Cent by Countries | Quantity (pounds) |
|---|---|
| Black Base S—(By); Gy. 100 | 10 |
| Oil Blue Z—(Q); Gy. 100 | 10 |
| Oil Brown AN—(Q); Gy. 100 | 10 |
| Oil Green; Gy. 100 | 47 |
| Oil Green ALB in Lumps—(Q) | |
| Oil Green ALG in Lumps—(Q) | |
| *Pigment Black Ex. Pdr.—(B); Gy. 100 | 100 |
| *Stone Fast Orange R Pdr. (Lithol Fast Orange R Pdr).—(B); Gy. 100 | 500 |

### Unidentified, Unclassified Dyes

| Name of Dye, Classification, Manufacturer, and Per Cent by Countries | Quantity (pounds) |
|---|---|
| *Japan Black MBG—(B); Ca. 65, Gy. 35 | 72 |

## STOP PEDDLING EXCUSES

(*Continued from page 329.*)

In the words of Homer, Aha!

Due, possibly, to what Poe called the Imp of the Perverse, but more probably to the fact that the hosiery people had all cut their eye-teeth at an early age, long before they went into the hosiery business, the reception accorded the new vat color was not what one could call effusive. In fact, for a while it bore all the earmarks of a cold, blighting frost.

In other words, as long as the hosiery people had the public trained to accept inferior dyeings plus the usual excuse, and at the same time could keep their dyeing costs down—well, why not?

Probably the fundamental reason was that they could not get used to paying as a lump sum eight or ten times what they had been paying for dyes. But the actual difference in dyeing cost is not great.

To-day, let us consider an extreme case. Suppose we are filling an order for blue cotton hose, and dyeing them in lots of 100 pounds. This would require 5 pounds of Direct Blue at 40 cents per pound; total, $2.00. When we get through, our color is fugitive and cannot be sold under a guarantee. Suppose, then, we decide to use the thoroughly fast Developed Blue. We shall require for 100 pounds of hosiery but 4 pounds instead of 5, and this dyestuff costs $1.00 a pound; total, $4.00. Now, since 100 pounds of hosiery would figure roughly to run about 100 dozen pairs, we find an actual difference in dyeing cost of about 2 cents per dozen pairs.

Probably no more extreme difference in dyeing cost as between fast and fugitive colors could be cited than this. In the case of most of the popular colors, cordovans, tans, and mode shades, the difference would be far less.

Yet, despite this, many hosiery manufacturers are to-day following the same old procedure of saving 2 cents or less per dozen pairs and selling their goods with the now fictitious excuse that American dye makers cannot give them colors which can be guaranteed.

In the name of goodness, why?

By using the fast colors the value of the product is materially enhanced, the colors can be guaranteed by the department store merchant, and the result is increasing good-will toward whatever brand the manufacturer sells under.

It is high time for the bitter-enders among the hosiery fraternity to stop selling excuses in place of good merchandise.

And in the meantime, the Du Pont company is to be congratulated on its really effective educational work.

# The Bleaching of Yarn Made from Bast Fibers

By E. CLAYTON, F.I.C.

*A Paper Read Before the West Riding Section, Society of Dyers and Colourists, and Published in the Journal of the Society*

THE bleaching of bast fibers in the form of yarn was undoubtedly practised to a limited extent in ancient times, but the difficulties associated with primi-

yarn was undoubtedly practised to a limited extent in ancient times, but the difficulties associated with primi-tive methods of handling fibers in this state while in a wet condition prevented the general extension of the process. Apart from this consideration, however, it is not to be supposed that the early craftsmen were ignorant of the fact that better fabrics were obtainable by conducting the bleaching operations after the yarn had been woven into cloth. It is highly probable, therefore, that yarn bleaching was only carried on when special kinds of woven fabrics containing colored patterns on a white ground were required.

As regards the modern practice of bast fiber yarn bleaching, it is evident that it has been gradually developed side by side with spinning and weaving, so as to enable the cloth manufacturer to supply the kinds of fabrics for which bleached or semi-bleached yarns are specially adapted. The bleaching of yarn intended for sewing thread and cord is also carried on to a considerable extent. The most important bast fiber from the bleacher's standpoint, as well as on account of its intrinsic value, is flax. Other members of this class possessing considerable interest are jute, hemp, and China grass. The bleaching of linen yarn will, however, be mainly considered in this paper, and in the first place it may be of interest to refer briefly to the mechanical operations through which flax passes prior to being spun into yarn.

Commercial flax is obtained from the bast portion of the stem of the flax plant. This portion occupies a position between the cortex and an inner growing portion termed the cambion, which is adjacent to the wood. In the center of the wood is the pith, while the cortex is covered by a thin layer known as the epidermis. If the living stems are killed by pulling, a gradual decay of those parts which appear to contain the least amount of fatty and waxy matters occurs with the result that the woody core ultimately becomes brittle and can be more or less readily separated by mechanical means from the flexible fibrous bast portion. This decay of the parts mentioned is accelerated by the presence of moisture, since it exerts a solvent action on the natural nitrogenous and other soluble constituents, and thus provides an excellent medium for the growth of bacteria. The latter produce certain enzymes which induce the partial decomposition of the pectose substances that bind the fibrous bast cells together and to the above mentioned portions of the stem of the plant. The conditions leading to the successful decay of parts of the flax stems, other than the fibrous bast, appear to have been known for thousands of years, and even at the present time many of the processes for facilitating the work are of a primitive nature. Considerable improvement has, however, taken place during the last few decades, and there is reason to believe that the old systems of retting will ultimately be displaced by more modern methods. The chief operations following retting are as follows:

The brittle wood is broken up into small pieces by means of a machine provided with fluted rollers, the flexible fibers remaining uninjured.

Here the operation is based on the fact that if a comparatively long but not too thick bundle of tough flexible filaments mixed with broken pieces of brittle wood is repeatedly struck with a series of wooden blades in the proper direction, it is quickly freed from these impurities. A considerable amount of waste occurs in this operation, the short fibers being known as "Scutching tow" and the woody matter as "shoves." The scutched fibers represent the raw flax of commerce, and consist essentially of long filaments of the ultimate fiber cells aggregated in the form of bundles. On reaching the spinner, these bundles are divided as much as possible by hand and mechanical means in order ultimately to obtain an aggregation of individual cells arranged in parallel order in a small number of units and attached to each other in such a way as to form a long fibrous mass. These cells possess an average length of about 30 mm., i. e., they are about ten times the length of the ultimate fibers of jute. The operations which immediately follow scutching are termed *roughing* and *hackling*. They are really combing operations carried out partly by hand and by machines specially adapted for treating the long fibrous bundles. The short fibrous masses or "tow" produced in these operations, are usually subsequently combed like some varieties of cotton and finally spun into yarn, while the long hackled fiber masses are now ready for the preparing operations which lead directly to spinning. Good qualities of scutched flax are frequently hackled or combed entirely by hand; or good and medium qualities may be first hackled by machine and finely finished or dressed by means of hand "combing." The product in these cases is called dressed line, and it is from this material that the finest varieties of linen fabrics are made. After the final hackling, the bundles of dressed line undergo the spreading and drawing operations from which they emerge in the form of a long and slender strand of parallel fibers. This is further drawn out and given a slight twist when it is ready for spinning.

Flax is spun either wet or dry. For the finest yarns the former method is essential, since it is only by softening the gummy and waxy impurities by means of warm water that the fibers can be properly drawn out and

twisted to the required extent. Scotch tow appears mostly to be spun dry, while Irish tow is commonly spun in the wet condition. During wet spinning a considerable amount of soluble matter is removed from the flax by the action of the water. The yarn produced is called linen yarn and, if intended for bleaching or dyeing in this form, it is reeled into hanks on a ninety-inch reel and made up into bundles.

Very little information concerning the exact nature of the natural impurities in flax seems to be available. Apart from the modification of these impurities during the retting operation, it is highly improbable that they differ to any great extent from the "impurities" associated with the physiological processes which occur during the growth of allied plants, and their thorough investigation seems to be a subject for the attention of agricultural and bio-chemists.

According to Muller (*Ber. uber die Entwickelung der Chem. Ind.*) two samples of hackled Belgian flax gave the following results on analysis:

| | No. 1 | No. 2 |
|---|---|---|
| Ash | 1.00 | 1.32 |
| Moisture | 8.65 | 10.70 |
| Extractive matter | 3.65 | 6.02 |
| Fat and wax | 2.39 | 2.37 |
| Cellulose | 82.57 | 71.50 |
| Intercellular substances and pectose bodies | 2.74 | 9.41 |

With respect to the impurities which can be extracted by (a) boiling water, and (b) certain organic solvents, the following results were obtained by the author some time ago; 10 grams of hackled Courtrai flax were extracted ten times with boiling distilled water for ten periods, each of half an hour's duration, and, after rinsing, the whole of the extracts were filtered and the filtrate evaporated to dryness. The residue weighed 0.354 gram, i. e., 3.5 per cent of the weight of the flax, and occurred as a fairly hard, brittle, scaly, dark brown, slightly hygroscopic substance, having a peculiar but not unpleasant smell. Although the aqueous filtrate was perfectly clear before evaporation and scarcely any deposit was observed on standing, only a very small portion of the residue obtained on evaporation was soluble in boiling water, so that it would appear as if polymerization or other complex change occurs during evaporation. Alcohol had no effect on the residue, but it was immediately dissolved by alkalis yielding yellow solutions, each of which gave a soapy lather on shaking. The dried flax was next extracted for half an hour with boiling petroleum ether, a residue of 0.108 gram being finally obtained or about 1 per cent of the original weight of the flax. This residue had a dark yellowish-brown color and was of a stiff greasy consistency. If rubbed, it readily adhered to the fingers and had a melting point of about 54 deg. Cent., it was moderately soluble in hot alcohol, but suffered very little change on boiling with sodium hydroxide. Boiling absolute alcohol was next used for extracting the dried flax from the previous experiment. The residue in this case representing 0.5 per cent of the original weight of the flax. It formed a pale greenish, very sticky, greasy substance, with a peculiar odor, and appeared to be unsaponifiable. The flax was finally boiled for one hour in 1 per cent aqueous potassium hydroxide solution, when a dark brown liquid was obtained. After rinsing, and boiling a second time in 1 per cent caustic potash solution, it was noticed that the solution was scarce colored. The loss in weight was equivalent to about 14 per cent of the original weight of the fiber. It should be mentioned that the hackled flax used in the above experiment was a Courtrai flax of the highest grade. In addition to the foregoing impurities, which in the author's opinion do not offer such great resistance to a properly devised system of scouring as is commonly supposed, there is usually present even in the best dressed line yarn a varying amount of woody or ligneous matter more or less firmly attached to the fibers. This material which has escaped the combing and other preparatory operations is termed "sprit." In general, it is found that the coarser the yarn, the higher is its woody content. Further, it is well known that if the flax has not been sufficiently retted, this woody matter or straw will adhere more firmly to the fibers in scutching and produce so-called dirty flax, which yields spritty yarn. One of the main difficulties in linen bleaching is due to the presence of this straw, which can be bleached to a permanent white only with considerable difficulty.

The bleaching of linen yarn differs from cotton yarn bleaching in that the stage to which the process is carried is determined by the particular kind of fabric for which the yarn is required. If we assume that the yarn contains on an average about 25 per cent of impurities, it follows that the removal of the whole of such impurities involves a serious loss in weight, and as there is a constant demand for a cheaper class of linen goods which need not necessarily retain the pure white appearance of fully bleached goods, a practice has arisen of limiting the bleaching process to various stages which are chiefly governed by loss in weight. In some cases, however, the bleaching of linen yarn is carried to its fullest extent, but the annual amount of yarn treated in this way seems to be comparatively small. The yarn used for the finest qualities of linen fabrics is always boiled in soda before weaving, so as to eliminate the greater portion of the impurities and enable the weaver to obtain a fabric with threads more closely set. The woven fabrics are subsequently fully bleached. With the exception of very high counts, practically all kinds of both tow and line yarns are bleached.

The following classes of linen yarn can be distinguished and their principal uses are mentioned:

In the production of boiled yarn for fine quality goods, it is customary to boil the material for several hours under a pressure of about 5 to 7 pounds with a lye made from sodium carbonate containing 10 per cent caustic soda, i. e.,

caustic soda ash. The kiers are generally of the low-pressure central puffer-pipe type; they are provided with full-sized lids, and the yarn capacity varies from about 1,200 to 2,000 pounds. Water is first run into the kier and heated to about 100 deg. Fahr.; the lye is then introduced and finally about 700 pounds of yarn in the form of loosely tied bundles, which are kept in position in the usual manner. With a lye of 3 to 4 deg. Tw., a loss in weight of about 16 per cent is obtained after boiling for about four to six hours. By means of a fork and crane arrangement, the yarn is removed after washing in the kier, the hanks being again washed individually, squeezed, or hydro-extracted, and dried.

### "Creamed" Yarn

The main object in "creaming" linen yarn is to produce a uniform cream-colored effect with a minimum loss in weight. If the yarn were first woven into cloth and the latter then subjected to a mild lye-boil with the object of subsequently bleaching it to a cream shade, it would be extremely difficult to obtain uniformity, whereas the more open nature of the fibers in the form of yarn enables the bleacher to obtain, more or less readily, the desired effect, though it must be admitted that the operation, as usually conducted, is one of the most drastic bleaching operations to which any textile fiber is subjected. Generally speaking, the degree to which "creaming" is carried varies to a considerable extent and largely depends on the nature of the yarn. The first operation is, in some cases, conducted by merely steeping the yarn over-night in hot alkali, followed by rinsing, and allowing the material to drain on trucks. The commonest plan, however, is as follows: Lye boil for three-quarters to one hour with 5 to 7 per cent of soda ash (containing 10 per cent caustic soda); rinse well in kier, remove and squeeze. Reel in bleaching powder solution 2 to 4 deg. Tw., for thirty to forty minutes, at about 18 deg. Cent. Wash; sour; wash. The coarser the yarn the higher must be the concentration of the available chlorine in the liquor employed for reeling.

Yarn containing only a small amount of sprit can invariably be bleached with a liquor of comparatively low available-chlorine content. In the reeling operation the hanks of yarn are supported above a brick tank—cemented on the interior surfaces—by means of wooden reels of square section which are attached to a suitable framework and actuated by worm and worm-wheel gearing so as to cause the hanks to rotate at a very slow rate of speed. The lower end of each hank is submerged to a depth of about one foot beneath the surface of the bleaching powder solution contained in the tank, so that the yarn is exposed alternately to the action of air and bleaching powder solution. If the latter becomes too "active" a little slaked lime is added as required. The average dimensions of the reeling tanks are 11 ft. × 7 ft. × 1 ft. 6 in., and an automatic device is provided for the purpose of altering the direction of rotation of the reel. This device comes into action once about every six minutes, which is the time required for the hanks to make a complete revolution. The slow motion of the reels prevents (a) a too rapid bleaching action, and (b) the yarn from becoming hairy or "slayed." A hank of "slayed" linen yarn has a somewhat similar counterpart in a hank of partly felted botany wool yarn, and everyone who has had experience of textile work will understand the attitude of the winders when such material is delivered. The hairiness is caused by the displacement of some of the external filaments of the threads owing to friction. These filaments have less elasticity than cotton, and do not cohere so well. Linen yarn very readily becomes "slayed" if subjected to friction while in a wet condition, so that the modern practice of yarn bleaching is directed towards the elimination of all operations involving either man or mechanical handling. No kind of yarn should ever be reeled more than once, or beyond a yellowish-cream stage. In some works the hanks of yarn, after reeling, are placed on trucks and allowed to lie overnight before washing. In others, they are allowed to hang on the raised reels for some time and then the whole framework with its contents is lifted by dydraulic power and placed in position over an adjacent similar, though deeper, tank. Here they

| Name of Yarn | Loss in Weight | Uses |
|---|---|---|
| Green or gray yarn (6)... | ..... | Common cloths. (Bleached after weaving.) |
| Boiled yarn (1)..... | Up to 20% | Fine linens; fine damasks; fine drills. (Fully bleached after weaving.) |
| "Creamed" yarn (5)..... | 8 – 12% | Creamed damasks; huck towels; crashes; colored border goods for stair coverings; and cheap class of roller towels. (Usually "bleached out" lightly after weaving.) |
| Half-white (4)..... | 10 – 16% | Cheap damasks; apron cloths; plain coarse unions for South American trade. |
| Three-quarter white (3).. | 12 – 20% | Cheap linens, unions, and damasks. |
| Full white (2)..... | 14 – 25% | Linen goods next to goods made from boiled yarn in quality. |

The numbers 1 to 6 refer to the qualities of the goods made from the yarns, i. e., No. 1 represents the best quality and No. 6 the lowest quality of goods.

are washed, while rotating, in running water for twenty minutes, and then removed and passed through a squeezing machine provided with rope-covered bowls, and washed during their passage by means of a spray. In another method of washing, the yarn is placed in a vat called a "kieve" provided with a false bottom of one kind or another, through which the water percolates. The vat is filled with water and the latter allowed to run away, the operation being repeated until the yarn is ready for souring, which is carried out by steeping in dilute sulphuric acid, 1 to 1½ deg. Tw., for about half an hour. Finally, the yarn is thoroughly washed in a kieve. In the second rinse, it is advisable to add a little sodium bisulphite, after which the material is subjected to two more rinsing operations. The finer yarns give satisfactory results if they are steeped instead of reeled in the bleaching powder solution; or they may be reeled for a short time in a dilute bleaching liquor. In some experiments carried out by the author, it was noticed that by steeping fairly coarse raw linen yarn in a solution of 2 per cent sodium hydroxide on the weight of the yarn at about 50 to 60 deg. Cent. for two to three hours, followed by washing and steeping in sodium hypochlorite 2 to 3 deg. Tw., for one hour at 18 to 20 deg. Cent., as good a cream was obtained as that produced by first lye-boiling in the ordinary manner and then reeling. The conditions which obtain in bleaching on an experimental scale, however, are generally widely different from those which obtain in practice, and the difficulties associated with the creaming of yarn, especially coarse counts, have led to attempts to displace entirely the reeling operation, either by a modified steeping method, or some system involving the circulation of the bleach liquor; but none of them appears to have met with much success. A spritty yarn needs to be so arranged that it is easily percolated by the bleach liquor. Further, the latter must be fairly concentrated and "active" in the first stage of application. Cases of over-oxidation of the linen cellulose often occur during reeling, and in the author's opinion this defect is the main cause of the tendering of "creamed" goods in the subsequent "bleaching out" process, although Higgins maintains (*J. S. D. C.*, 1918, p. 35) that such tendering is due to the presence of mineral acid, and puts forward the results of various experiments to support his contention. If the yarn is dried after the last rinse mentioned above, it will possess a somewhat hard handle and be difficult to wind. It is advisable therefore, in most cases, to work it, after the final rinsing operation, for a short time in a solution of a neutral soap, with or without the addition of an oily emulsion. The soap interacts with any traces of acid which may still be present in the fibers, so that there should be no danger of tendering from this source on subsequent storing. After squeezing, the yarn is shaken out on poles and hung up on rods in a drying loft heated by steam pipes. Heavy hexagonal wooden rods are placed in the lower ends of the hanks in order to keep the threads straight and tight. The hanks are shaken out again when about half dry and again when dry. They are then made up into bundles and packed by hydraulic pressure.

### Half-White Yarn

The raw yarn is creamed, as already indicated, and, after a thorough rinsing, is "scalded," i. e., boiled with a weaker lye than that used in the first lye boil, the following operations being similar to those already mentioned, with the exception that the chemicking is carried out by steeping instead of reeling. If the yarn intended for half-white is not too spritty there is no reason why the first lye boil should not be of such a nature as to remove about 14 per cent of impurities, so that a reeling operation alone may give the required tint, or at any rate it may serve to carry the process to such a point that an additional steeping in bleach liquor, preceded and followed by the usual operations, gives the desired result.

### Three-Quarter and Full White

These stages of bleaching are best suited for good and fairly good quality yarns. One lye boil and two or more "scalds," together with the usual intervening operations, may complete the process in either case, but the amount of lignified tissue in the yarn is undoubtedly the chief factor in determining the exact mode of procedure. White yarns are usually blued in a soap bath before squeezing.

### Bleaching Linen with Sodium Peroxide

Solutions obtained by dissolving sodium peroxide in ice-cold water to which various additions have been made and then gradually raising the temperature of the liquor to about 70 or 80 deg. Cent., have long been advocated for the bleaching of vegetable fibers. To obtain fairly satisfactory results, efficient circulation of the liquor is essential, and in the case of linen, one or two lye boils should precede the actual bleaching, since if sodium peroxide is used directly for the raw yarn, some of its available oxygen is employed in bleaching impurities which can just as easily be removed from the fiber by boiling with soda carbonate solution. The "sodium peroxide bleach" seems to be less efficient than hypochlorites in its action on the "sprit" contained in linen yarn. In any case, the use of this substance for the actual bleaching of linen yarn does not appear to offer any great advantages in comparison with hypochlorites, except in those cases where it is desirable to effect a partial bleaching of the material in the kier after the first or second lye boil, so as to enable a considerable reduction to be made in labor costs and in the amount of handling of the material. In almost all cases of linen bleaching where sodium peroxide is used, it is advisable, if not essential, to effect the final whitening of the material with the aid of hypochlorites. The careful employment of the peroxide in the first stage of "creaming" linen yarn might result in a considerable reduction in the time occupied in the subsequent reeling operation.

### Bleaching of Jute and Hemp

Both these fibers in the form of yarn are bleached to a moderate extent. A comparatively mild alkali-boil, followed by rinsing, steeping in sodium hypochlorite solution, washing, treating with dilute sodium bisulphite or thiosulphate solution, and washing again, represent a sequence of operations which yields satisfactory results with both fibers. A simpler method, especially for jute, consists in the employment of sodium peroxide, with or without the usual additions, the temperature of the bath being gradually raised to about 70 to 80 deg. Cent. The "white" obtained on jute in this manner is rather better than that obtained with sodium hypochlorite, is more permanent, and, of course, less handling of the material takes place.

### Observations on the Theory of Bleaching

Our knowledge of the behavior of hypochlorites in bleaching textiles has been considerably extended during the last decade by the labors of R. L. Taylor, S. H. Higgins, and others. According to Higgins, the bleaching action of these salts is due to their instability, which results in the direct liberation of nascent oxygen. He also maintains (*J. S. D. C.*, 1912, p. 254) that free hypochlorous acid is invariably the active agent in the process and that chlorine in the free state has no bleaching power. On the other hand, Taylor (*ibid*, 1922, p. 93) has shown that pure free hypochlorous acid is less active than chlorine water in bleaching various natural and artificial coloring matters and that neither this acid nor chlorine has much effect on the coloring matters of linen, whereas they are readily bleached by means of hypochlorites. Coward (*ibid*, 1922, p. 97) has expressed the opinion that the difference between free hypochlorous acid and its salts in bleaching linen is probably due to a high degree of ionization in the case of solutions of the latter and low ionization in the case of the free acid.

It has, of course, long been known that comparatively dilute solutions of hypochlorites readily decompose on standing, especially in presence of organic matter or metallic catalysts, while the influence of the carbon dioxide in the air, as well as that produced by the oxidation of the coloring matters during bleaching, is generally regarded as having an important bearing on the interactions involved. It is probable that, apart from its action in decreasing the alkali-content of hypochlorites, particularly bleaching powder solution, the influence of the former has been overrated. If, for example, two equal amounts of raw flax yarn are steeped in equal volumes of slightly alkaline sodium hypochlorite solution 2 deg. Tw., for one hour during which period air and oxygen respectively are aspirated through the solutions, it is found that there is no appreciable difference in the results. In another series of experiments equal weights of green flax yarn were treated as follows: (1) Steeped in 150 c.c. of cold caustic soda solution (2.5 per cent on weight of yarn) for half an hour and the temperature then raised slowly to 80 deg. Cent. in the course of one hour; (2) like (1) but used 5 per cent of sodium carbonate; (3) like (1) but used 4 per cent of sodium peroxide; (4) untreated yarn. Nos. 1, 2 and 3 were thoroughly washed in hot running water for fifteen minutes, squeezed and placed in separate beakers, each of which contained a definite volume of sodium hypochlorite solution 2 deg. Tw. No. 4 was immersed directly in a similar volume of the latter. Bleaching appeared to take place at first most rapidly in the cases of (3), (1) and (2), but after a short time the action practically stopped in the case of (3). At the same time it became very energetic in the cases of (2) and (4), particularly the latter, a considerable amount of foam, evidently produced by the escape of gas, collecting on the surfaces of the liquids. At the expiration of about one and one-half hours, there did not appear to be much difference in the "whites" obtained, though (3) had previously been partially bleached with sodium peroxide. These results seem to show that the greater the amount of natural organic impurities in the fibers, the more "active" becomes the hypochlorite solution, and such impurities evidently exercise a far more important function than the carbon dioxide of the air in promoting the decomposition of such solutions. Indeed, when it is considered that in machine chemicking one or more tons of cotton cloth in the rope form are frequently tightly packed in pits, after having been impregnated with a hypochlorite solution, and often allowed to stand for several hours to facilitate the bleaching action of the solution, it is not unreasonable to assume that such action is probably influenced only to a very slight extent by the carbon dioxide of the air, since apart from the small amount of air retained by the cloth there cannot be free circulation of the air through its mass.

The insoluble products of the hydrolysis of the impurities of linen yarn do not influence the foregoing results, because, in addition to the possible hydrolytic action of the alkali hydroxides at the temperature employed, it was found that after boiling a sample of raw yarn in 5 per cent hydrochloric acid for half an hour, rinsing thoroughly, neutralizing with dilute ammonia and washing again, no appreciable difference was observed in the rate of bleaching when carried on under the same conditions as those under discussion. It is possible that in linen bleaching, a considerable amount of gaseous matter produced during the "hypochlorite steep" does not readily detach itself from contact with the fiber masses, and in this way the bleaching of the impurities may be retarded. Exposure of the goods to air, from time to time, is thus suggested. Although, as previously stated, Higgins (*J. S. D. C.*, 1913, p. 88) ascribes weak bleaching properties to free chlorine, he is of the opinion that nascent chlorine is a powerful bleaching agent, but does not state whether chlorination or oxidation is meant. That the nascent chlorine produced by the oxidation of hydrochloric acid with manganes dioxide has very little bleaching action on the coloring matters of linen can be readily

shown by immersing raw flax fibers in this mixture and warming, if necessary, to about 40 deg. Cent. On subsequently treating the fibers with sodium bisulphite and dilute acid, followed by rinsing, it will be found that there is practically no difference between fibers which have been treated with concentrated hydrochloric acid alone at 40 deg. Cent. and those treated with the same acid in presence of manganese dioxide under like conditions, and the chlorine evolved in the latter case cannot be regarded as dry chlorine. If, on the other hand, a piece of Indigo dyed cloth be treated in the same way, the coloring matter is quickly bleached, leaving, after a bisulphite steep, a slight brownish residue which exhibits a certain amount of resemblance to isatin in its behavior towards reagents. It would appear, therefore, that these results support Taylor's contention that the coloring matters of linen behave abnormally in presence of chlorine. Moreover, it should be noted that the nascent oxygen produced on warming an alkaline solution of potassium permanganate is not nearly so energetic in its action on Indigo as is that of nascent chlorine produced in the manner mentioned above, yet it is highly probable that the latter result is due to oxidation. Many chemists appear to hold the view that in the bleaching of linen yarn with hypochlorites, some of the impurities are first chlorinated, whereby their ultimate removal in the "scalds" is facilitated. This would explain, to some extent, why it is not advisable in bleaching coarse linen yarns to remove too much of the impurities in the first lye-boil, since these act as a protective sheath for the linen cellulose during the reeling operation, and thus enable the bleacher to deal drastically with the "sprit." In order to determine whether chlorination of the impurities can be effected by means of nascent chlorine or not, the following experiments were carried out: 20 grams of raw linen yarn and 20 grams of jute were separately steeped in sodium hypochlorite solution 5 deg. Tw., to which pure dilute sulphuric acid was added. The material was then washed in hot running water for half an hour and in cold water for fifteen minutes. It was next steeped in 5 per cent sodium thiosulphate for fifteen minutes, and finally washed and dried. There was no free chlorine in either fiber, but after fusing with sodium and applying the usual test, a distinct precipitate was obtained in both cases, though it was larger in amount in the case of the solution derived from jute. Nitrogen could not be detected by the sodium test. The "non-chlorinated fibers" gave only a faint opalescence on fusion with sodium and testing in the usual way with silver nitrate. A portion of each of the "chlorinated" fibers was next boiled for half an hour with 5 per cent sodium carbonate, washed, dried, and tested as before, but scarcely any evidence of the presence of combined chlorine could be detected. It thus appears that chlorination of the impurities in linen and jute can be accomplished by means of nascent chlorine quite apart from its bleaching action, but whether or not this occurs in actual practice can only be determined by examination of the actual goods. Some of the experiments described above were carried out by M. Hastie, to whom thanks are herewith expressed.

### Discussion

The chairman (H. Jennings) said it was evident that the process of bleaching flax and similar fibers resembled the bleaching of wool and cotton in that one could not lay down a law which would apply to all cases. The process depended to a very large extent on the kind of fabric for which the yarn would eventually be used.

A. Silverwood asked if Mr. Clayton had any experience of the action of mercerizing on linen before bleaching.

The lecturer replied in the negative, but said that linen yarn and woven goods had long been treated with concentrated caustic soda for the manufacture of special hygienic materials. One variety of unbleached linen fabric used for vests, etc., was very soft and possessed great elasticity, and he understood that these effects were produced by the use of caustic soda.

The chairman asked if it were not usual to treat linen with caustic soda rather than sodium carbonate before bleaching?

The lecturer said linen bleachers were very careful in the use of caustic alkali, because it had a tendency to remove too quickly the fatty and waxy matters cementing the ultimate fibers, and if that occurred it was difficult to bleach the sprit or woody matter without producing a badly slayed yarn. Consequently, it was the general custom to employ only a slightly caustic alkali in the first lye-boil, so that the long flax lines were kept as constant as possible without any fibers being detached. Moreover, if raw linen were subjected to a drastic boiling operation with caustic soda, its normal physical properties would be degraded.

H. Foster asked if Mr. Clayton had done any experiments in connection with the bleaching of jute cloth, which was more difficult to bleach than yarn. The use of sodium silicate in the bleaching of jute had been recommended. Was it in common use?

The lecturer said a patent was taken out many years ago for the employment of sodium silicate in the bleaching of linen, but its use had been discontinued. It was considered that there was a possibility of silica being left in the fibers, with the result that the friction developed during the subsequent calendering and beetling tended to disrupt the fibers. Probably sodium peroxide would be the best agent to use in the bleaching of jute cloth, provided, of course, that efficient plant was available. There was very little difference between the results obtained with a hypochlorite and with sodium peroxide respectively. When using the latter, some of the impurities were removed and others bleached at the same time, whereas with a hypochlorite it was usually necessary first to scald the jute with sodium carbonate solution. Sodium silicate, in his opinion, should not be used in the treatment of vegetable fibers at high temperatures.

# Beam Dyeing

By H. JALA

(*Concluded from page 292.*)

In regard to the handling of the various classes of dyes on the beam machine, there is not a great deal to be said. The making up is virtually the same, the application slightly different. Below are a few general formulas which are working successfully at the present time:

After placing the beam in the machine, boil out with clean water, using either soda ash or Turkey red oil according to the nature of the water. If the water is soft, soda ash can be used. If hard, it is advisable to substitute about 2 per cent of Turkey red oil and after the boil-out a little of the oil can be left in the bath. Circulate from the inside out, and after getting to a boil close the lid and boil for half an hour. After the boil-out this liquor is either run off or retained for the dye bath, according to the dye. If run off, fresh water is added, brought to a boil or whatever temperature is required and half the dye added in the circulation box. The dyeing is always begun with a circulation of outside in, for the reason that if the liquor is too hard to get through the yarn at the beginning, which sometimes happens, there is less danger of channeling the beam this way than the other. The dyeing operation generally consumes about an hour, the circulation being 20 minutes × 15 minutes × 15 minutes × 10 minutes, beginning with outside in and ending with inside out, the other half of the dye being added at the beginning of the first inside-out period and at the beginning of the outside-in period. The lid is then raised and the beam washed from inside out until the water is clear, when it is blown dry with the compressed air. There is a certain class of direct colors which can be applied on a bleach bottom by bleaching and dyeing at the same operation. This is done by the addition of sodium peroxide to the dye bath, and produces excellent results. Most direct colors, especially light shades, dye more evenly starting at a low temperature. This applies also to

On account of the extreme solubility desired for this class of work, it may be found more difficult to select a line of sulphur colors. Even when apparently perfectly soluble, some dyes have the quality of being hard to force through the yarn, which increases the risk of channeling. In fact, it seems impossible to apply some colors without channeling somewhat, even though the channels may not be large enough to be of any consequence. This is not a peculiarity of sulphur colors, but applies to some of all kinds; and these, of course, should be avoided. It is not at all impossible to select a line of sulphur colors satisfactory both as to solubility and brightness of shade.

After placing the beam in the machine, boil out with soda ash or Turkey red oil, circulated from inside out. Close the lid after getting the boil, reverse the circulation to outside in, and half the dye liquor and run twenty minutes. Reverse the circulation to inside out, add the balance of the dye liquor and run fifteen minutes. Reverse the circulation to outside in, add the required amount of salt and run fifteen minutes. Reverse the circulation to inside out, run ten minutes, and while on this run raise the lid. Oxidize with the air if necessary, wash until cold, then heat the water to 120 degrees and wash until clear of sulphide. Blow dry with the air.

Primuline can be used as an example of this class of colors, all of which are handled much the same way. The primuline is dyed an hour at a boil just like any other direct color, the circulations being 20 minutes — 15 minutes — 15 minutes — 10 minutes, starting with outside in and ending with inside out, the lid being raised on the last change, and all further operations carried out with the lid up and an inside-out circulation. A wash of a few minutes is given until the water runs clear and the beam is cold, when the diazotizing bath is introduced into the circulation box and run until a good color is obtained, which will be about fifteen minutes. It is then washed again until clear, about fifteen minutes, and developed. The developing bath will take about fifteen minutes to produce the fully developed color, and after that there will be another fifteen minutes wash which is heated to 160 degrees during the run. The beam is then blown dry. In spite of the apparent complexity of the operation, Primuline is one of the most satisfactory dyes for this work. It never channels a beam and never fails to produce an even shade.

This class of dyes presents some difficulty because of the presence of caustic soda in the bath. It appears that the well-known mercerizing action of the caustic contracts the yarn to an extent sufficient to require considerable pressure to force the liquor through the beam. A high pressure from whatever cause increases the risk of channeling, and a channeled place of any size on a beam renders the even dyeing of that beam impossible. For that reason, while vat colors can be successfully applied, they must be handled more carefull than others.

Boil out for thirty minutes at 180 deg. Fahr. with 3 per cent soda ash, then cool to 90 deg. Fahr. and add to the bath, glue 2½ per cent, caustic 1½ per cent, hydro 1½ per cent and Turkey red oil 2½ per cent.

Run this ten minutes and then begin to work into the circulation box the dye, which has previously been reduced with the necessary caustic and hydro in 20 gallons of water. Dye thirty-five minutes at 90 deg. Fahr. as follows, beginning with outside in 4 × 3 × 8 × 6 × 8 × 6. Raise to 120 deg. Fahr. and dye twenty minutes, 10 × 10. Air and wash with 1½ per cent perborate of soda at 180 deg. Blow dry.

With indigo the method is somewhat different. The standing bath is sprung with caustic and hydro, and the required amount of indigo, which has been properly reduced, is added to it. It is then pumped directly to the dry beam without any previous boiling out. This circulation is from an hour to an hour and a half for the heavy shades, and is altogether from the outside in, except the last ten minutes, during which the lid is raised. After the liquor has been pumped back into the standing tank, the beam is oxidized with the air, then washed until the water runs clear. The water is then heated to 160 deg. Fahr. and 1 per cent ammonia and 2 per cent Turkey red oil added, and the wash continued for a few minutes, after which it is blown dry and taken out.

Bleaching can be accomplished with excellent results in the beam machine. It is, of course, necessary that both the beam and the machine be either made entirely from or else lined with some substance not affected by the bleach liquor, such as lead, aluminum, monel metal, etc. The circulation of the liquor can be maintained entirely from the inside out and bleach machines can accordingly be made without a lid. The operation is very simple and requires only ordinary care for good work. After a boil out of an hour and a half with Turkey red oil, the bleach liquor is circulated for about an hour, or until the desired bleach is obtained, after which the anti-chlorine is run for fifteen minutes. The beam is then washed with clear water and blown dry.

These few formulas are not intended to be laid down as rules of operation, but only intended to convey in a general way the impression that in beam dyeing the modus operandi is not at all complicated nor difficult and that with proper care and intelligence a great saving can be accomplished in labor cost and a great improvement effected in the running of the weaving over the long-chain system. There is no doubt that it has its own peculiarities and drawbacks, as has any industrial process, but it is safe to say that within its proper field it has no competitor.—Cotton.

---

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, OF THE AMERICAN DYESTUFF REPORTER.

Published biweekly at New York, N. Y., for April 1, 1923.

State of New York, County of New York, ss.: Before me, a notary public in and for the State and county aforesaid, personally appeared Alfred P. Howes, who, having been duly sworn according to law, deposes and says that he is the publisher of the American Dyestuff Reporter and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor and business managers are:

Publisher—Alfred P. Howes, 4109 Woolworth Building, New York City. Editor—Louis A. Olney, Lowell, Mass. Managing Editor—Laurance T. Clark, 4109 Woolworth Building, New York City. Business Manager—Alfred P. Howes, 4109 Woolworth Building, New York City.

2. That the owners are: Howes Publishing Co., Inc., 4109 Woolworth Building, New York City; Louis A. Olney, Lowell, Mass.; Alfred P. Howes, 4109 Woolworth Building, New York City; Derfla H. Collins, Upper Montclair, N. J.; Mary K. Howes, Northampton, Mass.; N. H. Hiller, Carbondale, Pa.; William F. Collins, Upper Montclair, N. J.; Jos. L. Schroeder, Hartsdale, N. Y.

3. That the known bondholders, mortgagees and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages or other securities are: None.

4. That the two paragraphs next above, giving the names of the owners, stockholders and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association or corporation has any interest direct or indirect in the said stock, bonds or other securities than as so stated by him.

A. P. Howes, Publisher.

Sworn to and subscribed before me this 19th day of March, 1923.

[Seal] Arthur R. Brice.

(My commission expires March 30, 1923.)

---

WANTED—Copies of the February 26, 1923, and February 12, 1923, issues of AMERICAN DYESTUFF REPORTER. Owing to extra demand, our file copies of the above issues have been exhausted. Anyone willing to part with one or more of these copies will confer a favor by addressing this office. AMERICAN DYESTUFF REPORTER, 4109 Woolworth Building, New York City.

WANTED—Boss dyer experienced in piece dyeing of broad silks, mixtures of silk and cotton, and silk and wool. Position open at once. State salary and age. Apply at Muller Gloria Mills, Norwalk, Conn.

WANTED by large dyestuff manufacturer an assistant to chemist in charge of application laboratory. Good dye testing and executive ability necessary. In application state fully, education and experience and give references. Address Box 226, American Dyestuff Reporter.

*Plant of Cheney Brothers, So. Manchester, Conn.*

*The information in this booklet is of vital value to you—write for it now.*

## *At Cheney Brothers seven years—absolutely no deterioration*

READ what one of the big factors in the silk industry says of Monel Metal:

> "We have used Monel Metal for stay bolts around or in connection with wood dyeing machine frames with excellent results, there being no corrosion of the metal whatsoever, whereas iron would show distress within a year's time. We have also used Monel for permanent staging hooks in ceiling timbers in dye-houses. Iron or steel in a similar location could not be trusted. . . . Monel we have the utmost confidence in. We also have some dyeing machines, the spiders and mechanism of which are of cast Monel. These have shown absolutely no deterioration whatever. The ordinary acid-resisting bronze would show considerable destruction in the same period of about seven or eight years."

Now check over this tabulation of comments by mill men on the reasons why they specify Monel Metal in dye-house use: "Increases life of equipment"; "Enables us to produce true colors"; "Reduces spoilage"; "Permits quick changes in colors, so reduces number of units required."

These and like facts have established Monel Metal in the textile field. Send for complete data on this tough, non-corrodible metal.

THE INTERNATIONAL NICKEL COMPANY
67 WALL STREET NEW YORK

INCo
MOnel metal

DH P&B

REGISTERED E. de Haën DH Hannover TRADE MARK

ANTIMONY SALTS 65%
CHROMIUM FLUORIDE CRYSTALS

P&B

AUSTRIAN BLOOD ALBUMEN
GLUES AND GELATINES

Sole Agents for the U. S. A.

**Pfaltz & Bauer, Inc.**
**300 PEARL STREET-NEW YORK**

P&B DH

S. R. DAVID
& COMPANY
INCORPORATED

Dyestuffs

252 Congress Street, Boston, Mass.
Hartford Office: 1029 Main Street
Tel. Main 1684

*YOU CAN USE IT*

WHITTAKER'S BOOK

*"The Testing of Dyestuffs in the Laboratory"*

FOR quick reference, as well as the acquirement of a broad, practical grasp of the subject, users of this popular work by Mr. Whittaker find it of every-growing value in practice.

"The Testing of Dyestuffs in the Laboratory" presents in condensed form the results of over twenty years' practical experience. It deals in general with the dyestuff testing laboratory and its functions and in particular with methods for the testing and evaluation of the different types of dyestuff, including the natural colors. Every dye chemist should order his copy NOW to insure early delivery.

PRICE $5.00, POSTAGE PAID

HOWES PUBLISHING COMPANY
4109 Woolworth Building NEW YORK CITY

# Tools of His Trade

Common law recognizes and upholds the right of a workman to his tools—his basic means of survival and maintenance.

The tools of a business enterprise are no less essential. It must have and use certain instrumentalities to get business, to do business and to hold business.

Having them, it grows and brings forth fruit—provided the tools are intelligently directed.

Deprived of them, it becomes stunted, withers, and eventually dies—no amount of intelligence can save it, lacking means of application.

The prime concern of any business is to get orders. It must have and use personal solicitors and advertising—the twin tools of salesmanship.

And when a business is ordered by its bank to curtail or stop the use of these productive forces—either or both—that business is being deprived of its tools.

Give business the right to progress!

[ Published by the American Dyestuff Reporter in co-operation with The American Association of Advertising Agencies ]

# Is a Fabric a Chemical Product?

## At first glance no—But

it is the chemical treatment which **sells** the goods. Color, finish, feel—these are the factors which influence the ultimate purchaser. A fabric may be faultlessly woven, of excellent material, yet it may be ruined by faulty dyeing, bleaching or finishing operations. Too much attention cannot be given these processes.

For over fifty years A. Klipstein & Co. have specialized in supplying the textile industry with dyestuffs and chemicals. Our organization includes specialists in every textile chemical process. Let them assist in solving your dyeing and finishing problems—helping your fabrics to **sell themselves.**

Among our products are:

### Dyestuffs and Colors of All Kinds

*Sizings—Softeners—Finishes*

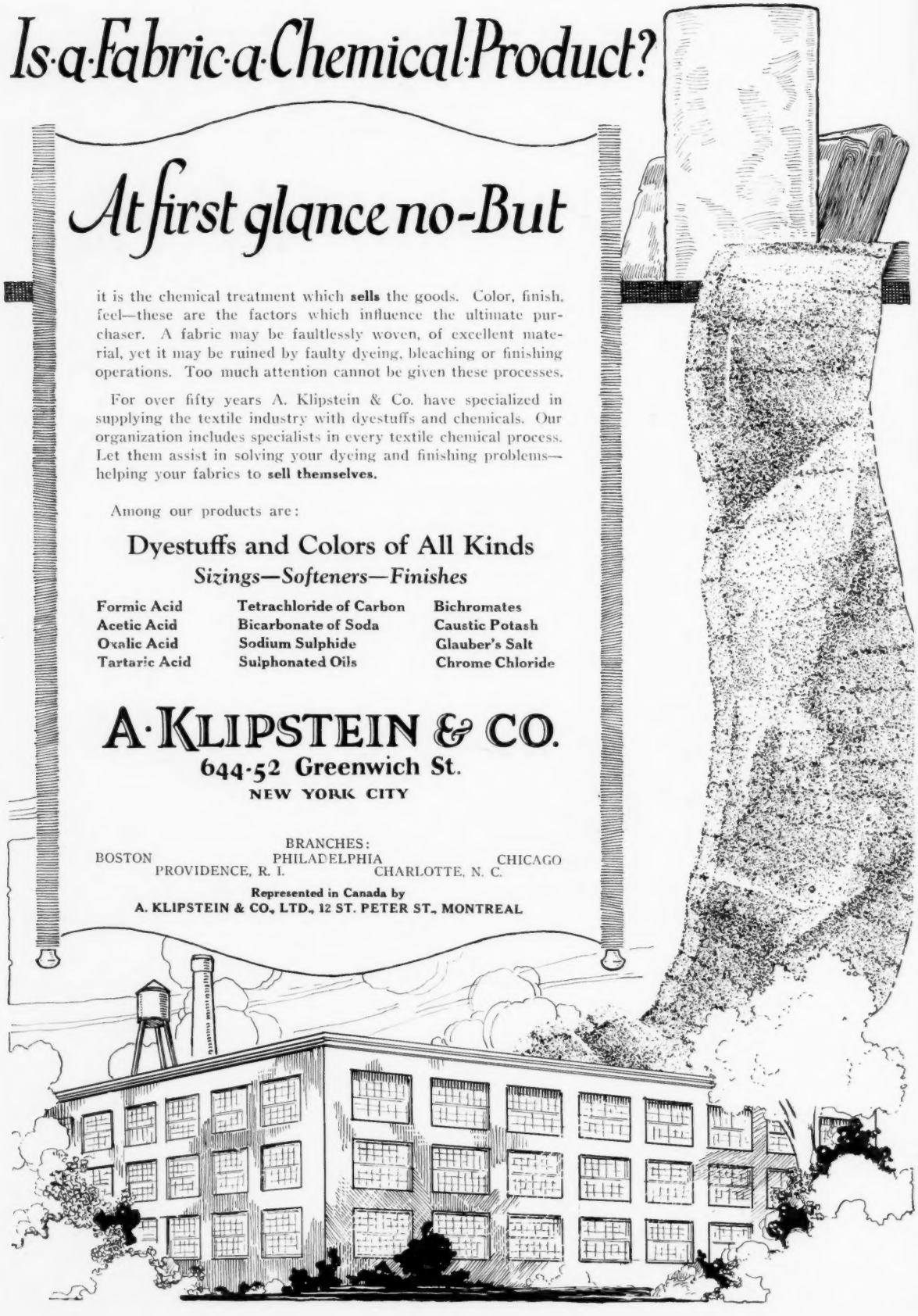
| | | |
|---|---|---|
| **Formic Acid** | **Tetrachloride of Carbon** | **Bichromates** |
| **Acetic Acid** | **Bicarbonate of Soda** | **Caustic Potash** |
| **Oxalic Acid** | **Sodium Sulphide** | **Glauber's Salt** |
| **Tartaric Acid** | **Sulphonated Oils** | **Chrome Chloride** |

## A. KLIPSTEIN & CO.

**644-52 Greenwich St.**

**NEW YORK CITY**

BRANCHES:

BOSTON PHILADELPHIA CHICAGO
PROVIDENCE, R. I. CHARLOTTE, N. C.

**Represented in Canada by**
**A. KLIPSTEIN & CO., LTD., 12 ST. PETER ST., MONTREAL**